

# Middlesex University Research Repository

An open access repository of

Middlesex University research

<http://eprints.mdx.ac.uk>

Kassimatis, Konstantinos (2000) Stock market development and economic growth in emerging economies. PhD thesis, Middlesex University. [Thesis]

This version is available at: <https://eprints.mdx.ac.uk/6320/>

## Copyright:

Middlesex University Research Repository makes the University's research available electronically.

Copyright and moral rights to this work are retained by the author and/or other copyright owners unless otherwise stated. The work is supplied on the understanding that any use for commercial gain is strictly forbidden. A copy may be downloaded for personal, non-commercial, research or study without prior permission and without charge.

Works, including theses and research projects, may not be reproduced in any format or medium, or extensive quotations taken from them, or their content changed in any way, without first obtaining permission in writing from the copyright holder(s). They may not be sold or exploited commercially in any format or medium without the prior written permission of the copyright holder(s).

Full bibliographic details must be given when referring to, or quoting from full items including the author's name, the title of the work, publication details where relevant (place, publisher, date), pagination, and for theses or dissertations the awarding institution, the degree type awarded, and the date of the award.

If you believe that any material held in the repository infringes copyright law, please contact the Repository Team at Middlesex University via the following email address:

[eprints@mdx.ac.uk](mailto:eprints@mdx.ac.uk)

The item will be removed from the repository while any claim is being investigated.

See also repository copyright: re-use policy: <http://eprints.mdx.ac.uk/policies.html#copy>

**Stock Market Development and Economic Growth in  
Emerging Economies**

**A thesis submitted to Middlesex University  
in partial fulfilment of the requirements for the degree of  
Doctor of Philosophy**

**Konstantinos Kassimatis**

**Business School**

**Middlesex University**

**2000**

## ACKNOWLEDGEMENTS

First of all, I would like to thank my family and especially my mother Haroula and my fiancée Rena for their constant support throughout my studies.

I would also like to thank Professor Paul Dunne and Dr Spyros Spyrou for their excellent supervision. Without their guidance and assistance it would not be possible for me to complete this thesis.

Finally, I would like to acknowledge Middlesex University for providing a three year studentship to support the research in this thesis

I take full responsibility for any errors or omissions in this thesis.

## Abstract

In the early 1980's several developing countries introduced liberalisation policies in their economies. One of the reforms they implemented was to develop their stock markets. The theoretical justification for the liberalisation process was provided by the work of McKinnon (1973) and Shaw (1973). Their model follows neo-classical assumptions on savings and investment. Other researchers later completed their model with respect to the stock market, and claimed that its development could benefit the emerging economies [Cho (1986)]. The aim of this thesis is to empirically examine if stock market development in a sample of emerging countries assisted economic growth or not. To examine this, we form three research questions. The first question is: what is the direct impact of stock market development on economic growth in developing countries? The second question refers to the indirect impact of stock market development on the economy via stock price volatility. The question is: has stock market volatility increased following liberalisation policies or not? The third question is: have the emerging stock markets become more integrated with each other and with developed markets following liberalisation? Stock market integration is a result of stock market development so we should expect these stock markets to become more integrated after they were liberalised. In examining these issues, we take into account the special circumstances surrounding each country. To this end we provide an overview of some of the emerging economies we examine and discuss the implications of their individual characteristics for our analysis. We carry out a literature survey which suggests that research in this area has been scarce. The few empirical evidence on these questions are mixed. This thesis aims to contribute to this growing literature by providing additional evidence on the questions we posed and by overcoming some of the problems which are inherent in the methodologies followed by previous researchers who examined these issues.



# **CONTENTS**

## **CHAPTER 1 INTRODUCTION**

1.1. Background . . . . .	1
1.2. Research objectives . . . . .	4
1.3. Structure of the thesis. . . . .	5

## **CHAPTER 2 THE EMERGING MARKETS - AN OVERVIEW**

2.1. Introduction . . . . .	8
2.2. Stock Markets in Emerging Countries . . . . .	8
2.2.1. Latin American economies. . . . .	10
2.2.2. East Asian economies. . . . .	14
2.2.3. Regional differences . . . . .	18
2.3. Countries profile . . . . .	19
2.3.1. Chile. . . . .	19
2.3.2. India. . . . .	22
2.3.3. Mexico. . . . .	26
2.3.4. South Korea. . . . .	30
2.3.5. Taiwan. . . . .	34
2.4. Summary and Conclusions . . . . .	37

**CHAPTER 3 THEORETICAL BACKGROUND**

**3.1. Introduction . . . . . 39**

**3.2. The financial markets development in emerging economies . . . . . 42**

**3.2.1. The financial repression paradigm . . . . . 42**

**3.2.2. The financial liberalisation thesis. . . . . 44**

**3.2.3. Post-Keynesian criticism of the financial liberalisation thesis . . . . . 45**

**3.3. Issues examined . . . . . 46**

**3.3.1. Stock market expansion and economic development in emerging economies. . . . . 47**

**3.3.1.1. The role of the stock market in an economy . . . . . 48**

**3.3.1.2. Equity markets versus banks . . . . . 50**

**3.3.1.3. Indirect foreign investment . . . . . 51**

**3.3.1.4. Financial deepening and the stock market. . . . . 52**

**3.3.1.5. The stock market in endogenous growth models . . . . . 53**

**3.3.1.6. Stock market volatility and economic development. . . . . 56**

**3.3.1.6.1. The neo-classical argument . . . . . 56**

**3.3.1.6.2. The Keynesian argument . . . . . 57**

**3.3.2. Integration of the ESMs with the world market. . . . . 58**

**3.4. Our research questions . . . . . 61**

**3.5. Summary and Conclusions . . . . . 63**

**CHAPTER 4 EMPIRICAL RESEARCH ON EMERGING STOCK MARKETS**

4.1. Introduction . . . . .	.64
4.2. The development of ESMs. . . . .	64
4.3. Foreign investment in ESMs . . . . .	68
4.3.1. “Pull” factors. . . . .	.69
4.3.2. “Push” factors . . . . .	.70
4.3.3. ESMs weight in foreign portfolios . . . . .	.70
4.3.4. Foreign investors and speculation . . . . .	.71
4.4. ESM development and economic growth . . . . .	.72
4.5. Volatility in ESMs . . . . .	76
4.6. Integration of emerging and developed markets . . . . .	.81
4.7. Portfolio diversification . . . . .	.86
4.7.1. Currency effect on diversification . . . . .	.88
4.7.2. Industry effect on diversification . . . . .	89
4.7.3. Diversification benefits using ex ante versus ex post data. . . . .	89
4.7.4. Attainability of returns . . . . .	90
4.7.5. Barriers to entry . . . . .	91
4.7.5.1. Demand side barriers . . . . .	.92
4.7.5.2. Supply side barriers . . . . .	.93
4.8. Efficiency in ESMs. . . . .	.94
4.9. Summary and Conclusions. . . . .	100

## **CHAPTER 5      DATA AND TESTING METHODOLOGIES**

5.1. Introduction. . . . .	103
----------------------------	-----

<b>5.2. Methodology and data for the first research question . . . . .</b>	<b>103</b>
<b>5.2.1. Testing methodology. . . . .</b>	<b>103</b>
<b>5.2.1.1. Stationarity. . . . .</b>	<b>104</b>
<b>5.2.1.2. Cointegration. . . . .</b>	<b>105</b>
<b>5.2.1.3. The Johansen methodology . . . . .</b>	<b>106</b>
<b>5.2.1.4. Constructing the long run equations . . . . .</b>	<b>107</b>
<b>5.2.2. Data . . . . .</b>	<b>108</b>
<b>5.3. Methodology and data for the second research question . . . . .</b>	<b>112</b>
<b>5.3.1. Testing methodology. . . . .</b>	<b>112</b>
<b>5.3.2. Data . . . . .</b>	<b>119</b>
<b>5.4. Methodology and data for the third research question . . . . .</b>	<b>121</b>
<b>5.4.1. Testing methodologies. . . . .</b>	<b>121</b>
<b>5.4.1.1. Integration with respect to stock market prices . . . . .</b>	<b>122</b>
<b>5.4.1.2. Integration with respect to risk. . . . .</b>	<b>123</b>
<b>5.4.1.2.1. Calculation of the financial risk premium . . . . .</b>	<b>125</b>
<b>5.4.1.2.2. Calculating the market value of the economy . . . . .</b>	<b>126</b>
<b>5.4.1.2.3. Calculating the economy's expected return and the standard             deviation of the return . . . . .</b>	<b>128</b>
<b>5.4.1.2.4. Calculating the economy's total and discounted debt. . . . .</b>	<b>128</b>
<b>5.4.1.2.5. Calculating the maturity of the debt . . . . .</b>	<b>129</b>
<b>5.4.1.2.6. The subordination principle . . . . .</b>	<b>129</b>
<b>5.4.2. Data. . . . .</b>	<b>130</b>
<b>5.5. Summary and Conclusions. . . . .</b>	<b>131</b>

**CHAPTER 6    EMPIRICAL ANALYSIS OF THE RELATIONSHIP  
BETWEEN THE STOCK MARKET AND THE REAL ECONOMY**

6.1. Introduction. . . . .	.133
6.2. Empirical results. . . . .	134
6.2.1. Chile. . . . .	.135
6.2.2. India . . . . .	138
6.2.3. Mexico. . . . .	.140
6.2.4. South Korea. . . . .	.143
6.2.5. Taiwan. . . . .	.146
6.3. Discussion of empirical results . . . . .	149
6.4. Summary and Conclusions. . . . .	155

**CHAPTER 7    EMPIRICAL ANALYSIS OF THE STOCK MARKET  
VOLATILITY BEFORE AND AFTER LIBERALISATION**

7.1. Introduction. . . . .	.157
7.2. Results from the GARCH estimation . . . . .	.158
7.3. Results from the news impact curves estimation. . . . .	.177
7.4. Discussion of empirical results. . . . .	.181
7.5. Summary and Conclusions. . . . .	183

**CHAPTER 8    REGIONAL AND GLOBAL STOCK MARKET  
INTEGRATION**



8.1. Introduction . . . . . 189

8.2. Integration with respect to stock prices. . . . . .189

    8.2.1. Other implications of stock market integration . . . . . .190

    8.2.2. Empirical results . . . . . .191

8.3. Empirical analysis of convergence between emerging and developed countries’ risk premium . . . . . .200

    8.3.1. Introduction. . . . . .200

    8.3.2. Calculation of the financial risk premium for the sample countries. . . . 202

8.4. Discussion of empirical results. . . . . .213

8.5. Summary and Conclusions . . . . . .215

**CHAPTER 9     SUMMARY AND CONCLUSIONS . . . . . 217**

**APPENDICES**

Appendix 1. . . . . .227

Appendix 2. . . . . .228

Appendix 3. . . . . .230

Appendix 4. . . . . .235

Appendix 5. . . . . .237

Appendix 6. . . . . .238

**REFERENCES . . . . . .239**

**TABLES**

<b>Table 5.1. Liberalisation of selected emerging markets . . . . .</b>	<b>120</b>
<b>Table 6.1. Cointegration results for Economic Growth and Financial Development in Chile from 1982 M1 to 1997 M10 . . . . .</b>	<b>137</b>
<b>Table 6.2. Cointegration results for Economic Growth and Financial Development in India from 1977 M1 to 1997 M11 . . . . .</b>	<b>139</b>
<b>Table 6.3. Cointegration results for Economic Growth and Financial Development in Mexico from 1977 M1 to 1997 M8 . . . . .</b>	<b>142</b>
<b>Table 6.4. Cointegration results for Economic Growth and Financial Development in South Korea from 1976 M1 to 1997 M11. . . . .</b>	<b>145</b>
<b>Table 6.5. Cointegration results for Economic Growth and Financial Development in Taiwan from 1977 M1 to 1997 M11. . . . .</b>	<b>148</b>
<b>Table 7.1. Adjustment procedure for the day-of-the-week effect . . . . .</b>	<b>160</b>
<b>Table 7.2. Adjustment procedure to remove autocorrelation . . . . .</b>	<b>161</b>
<b>Table 7.3. Basic statistics for the unpredictable returns . . . . .</b>	<b>162</b>
<b>Table 7.4. Lagrange multiplier statistic for ARCH effects in the conditional volatility of adjusted stock price returns in the sample countries . . . . .</b>	<b>163</b>
<b>Table 7.5. GARCH(1,1) estimation for daily returns of the eight emerging stock markets for the whole sample period . . . . .</b>	<b>165</b>
<b>Table 7.6. Tests for structural shift in the unconditional variance and mean of stock returns in the sample countries . . . . .</b>	<b>166</b>
<b>Table 7.7. Equation log likelihood function for different orders of the GARCH process for the pre-liberalisation period. . . . .</b>	<b>167</b>

Table 7.8. Equation log likelihood function for different orders of the GARCH process for the post-liberalisation period . . . . .	.168
Table 7.9. Selection criteria values for different distribution assumptions for the GARCH models estimated . . . . .	.169
Table 7.10. GARCH(1,1) estimation for daily returns of the eight emerging stock markets for the pre-liberalisation period . . . . .	.171
Table 7.11. GARCH(1,1) estimation for daily returns of the eight emerging stock markets for the post-liberalisation period. . . . .	.172
Table 7.12. Half life of a shock pre- and post-liberalisation . . . . .	.174
Table 7.13. Wald tests for equality of $\alpha$ and $c$ coefficients before and after liberalisation. . . . .	.175
Table 7.14. EGARCH(1,1) estimation for daily returns for the pre-liberalisation period. . . . .	177
Table 7.15. EGARCH(1,1) estimation for daily returns for the post-liberalisation period. . . . .	178
Table 8.1. Augmented Dickey Fuller tests for unit roots in stock market indices and their first differences. . . . .	191
Table 8.2 Cointegration results for the Latin American and US markets. . . . .	192
Table 8.3. Testing restrictions on the $\alpha$ and $\beta$ matrices from Table 8.2 . . . . .	193
Table 8.4. Cointegration results for the Latin American and US markets . . . . .	194
Table 8.5. Cointegration results for the Asian and US markets . . . . .	195
Table 8.6. Testing restrictions on the $\alpha$ and $\beta$ matrices from Table 8.5 . . . . .	196
Table 8.7. Cointegration results for the Asian and US markets . . . . .	197

**Table 8.8. Testing restrictions on the  $\alpha$  and  $\beta$  matrices from Table 8.7 . . . . . 198**

**Table 8.9. Results for 1967 - 1984 for the profit regression. . . . . 203**

## FIGURES

Figure 2.1. Net private debt and portfolio investment flows to emerging markets. .9	.9
Figure 2.2. Annual real growth in GNP per capita for selected emerging markets . 9	.9
Figure 2.3. Market capitalisation of selected Latin American stock markets . . . . 10	10
Figure 2.4. Number of listed companies in selected Latin American stock markets .11	11
Figure 2.5. Share of market capitalisation held by the ten largest stocks in selected Latin American countries. . . . . 12	12
Figure 2.6. Value Traded in selected Latin American stock markets . . . . . 13	13
Figure 2.7. Share of value traded held by the ten most active stocks in Latin American countries . . . . . 13	13
Figure 2.8. Market Capitalisation of selected East Asian stock markets . . . . . 15	15
Figure 2.9. Number of listed companies in selected East Asian stock markets . . 15	15
Figure 2.10. Share of market capitalisation held by the ten largest stocks in selected East Asian countries. . . . . 16	16
Figure 2.11. Value Traded in selected East Asian stock markets. . . . . 17	17
Figure 2.12. Share of value traded held by the ten most active stocks in East Asian countries . . . . . 18	18
Figure 7.1. News impact curves for Argentina. . . . . 179	179
Figure 7.2. News impact curves for India. . . . . 179	179
Figure 7.3. News impact curves for Pakistan. . . . . 179	179
Figure 7.4. News impact curves for Philippines . . . . . 180	180



Figure 7.5. News impact curves for South Korea. . . . .	180
Figure 7.6. News impact curves for Taiwan . . . . .	180
Figure 7.7. Adjusted daily returns of the Argentinean stock market index . . . .	185
Figure 7.8. Adjusted daily returns of the Chilean stock market index . . . . .	185
Figure 7.9. Adjusted daily returns of the Indian stock market index. . . . .	186
Figure 7.10. Adjusted daily returns of the Korean stock market index . . . . .	186
Figure 7.11. Adjusted daily returns of the Mexican stock market index. . . . .	187
Figure 7.12. Adjusted daily returns of the Pakistani stock market index . . . . .	187
Figure 7.13. Adjusted daily returns of the Philippines stock market index . . . .	188
Figure 7.14. Adjusted daily returns of the Taiwan stock market index . . . . .	188
Figure 8.1. Market value and total debt for Chile for 1984 - 1996 . . . . .	204
Figure 8.2. Market value and total debt for India for 1984 - 1996 . . . . .	204
Figure 8.3. Market value and total debt for Mexico for 1984 - 1996 . . . . .	204
Figure 8.4. Market value and total debt for Pakistan for 1984 - 1996 . . . . .	205
Figure 8.5. Market value and total debt for Philippines for 1984 - 1996. . . . .	205
Figure 8.6. Market value and total debt for South Korea for 1984 - 1994. . . . .	205
Figure 8.7. Value of residents equity and market value of debt in Chile. . . . .	207
Figure 8.8. Value of residents equity and market value of debt in India . . . . .	207
Figure 8.9. Value of residents equity and market value of debt in Mexico . . . .	208
Figure 8.10. Value of residents equity and market value of debt in Pakistan. . . .	208
Figure 8.11. Value of residents equity and market value of debt in Philippines. .	208
Figure 8.12. Value of residents equity and market value of debt in South Korea .	209
Figure 8.13. Financial risk premium for Chile's foreign debt for various levels of foreign investment ownership. . . . .	210

**Figure 8.14. Financial risk premium for India’s foreign debt for various levels of foreign investment ownership. . . . . 211**

**Figure 8.15. Financial risk premium for Mexico’s foreign debt for various levels of foreign investment ownership. . . . . 211**

**Figure 8.16. Financial risk premium for Pakistan’s foreign debt for various levels of foreign investment ownership. . . . . 212**

**Figure 8.17. Financial risk premium for Philippines’ foreign debt for various levels of foreign investment ownership . . . . . 212**

**Figure 8.18. Financial risk premium for South Korea’s foreign debt for various levels of foreign investment ownership. . . . . 213**

## **CHAPTER 1: INTRODUCTION**

### ***1.1. Background***

In the early 1980s, several developing countries were unable to service their sovereign debts. The result was the well known debt crisis, which several academics and professionals feared would bring a severe crisis in the banking sector of the developed countries. This crisis has yet to materialise. The developing countries however, were faced with a credibility problem which prevented them from borrowing the funds they needed from abroad, and when they did, it was at high interest rates. In order to attract funds from abroad, several developing countries encouraged the development of stock markets and implemented a series of liberalisation policies. These aimed at making these economies attractive to foreign investors. During the last two decades, several of these countries managed to attract large funds from abroad. It is doubtful, however, if this inflow of foreign investment resulted in higher levels of economic growth for these countries or not. Research on the effect on this sudden foreign investment influx on the developing economies became important during the last twenty years. Prior to the 1980s, such literature was almost non-existent and would have been irrelevant. Few studies have empirically examined the effect of the liberalisation policies on these economies, mainly because of the scarcity of macroeconomic data. The aim of this thesis is to contribute to this growing literature by examining some of the issues involved.

On a theoretical basis, the liberalisation process is supported by the pioneering work of McKinnon (1973) and Shaw (1973). They each developed a theoretical model to demonstrate the adverse effect of financial repression on the developing economies' growth. McKinnon and Shaw argued that once a country liberalised its financial markets, interest rates would rise, increasing savings. The money saved would then be available for investment, which should become more efficient because of the higher interest rates. Under financial repression, interest rates are kept artificially low, so projects which would not be profitable otherwise could go ahead because of the low cost of financing. Demand for credit is very high and banks resort to credit rationing.

The McKinnon-Shaw theory was perceived as a valid argument to transform protectionist economies to market based ones. One of the transformations that took place was the development of stock markets in these economies and - in many cases - the opening up of the stock markets to foreign investors. However, neither McKinnon nor Shaw advocate the development of a stock market in their framework. Actually, Shaw argues that the development of a stock market in the early stages of development may be very expensive for the developing economies. A role for the stock market is provided by Cho (1986) who develops a model to show that credit markets cannot act efficiently in the absence of a stock market. Furthermore, some models of endogenous growth [e.g. Boyd and Smith (1996)] show that both bank and equity finance can make a positive contribution to the economic development of a country. In turn, as the economy develops, both the banking sector and the stock market develop. The relationship between the economy and the financial markets is therefore, positive and bi-directional.

On an empirical level, there are hardly any studies examining this relationship for developing economies. A recent study by Arestis and Demetriades (1997) examines this relationship for South Korea and find that financial repression in South Korea had a positive effect on economic growth. However, Arestis and Demetriades recognise that South Korea is a unique case and in other countries financial repression had the opposite effect. Earlier studies [e.g. De Gregorio and Guidotti (1995)] find that financial development may lead to lower growth levels in the absence of an adequate regulatory framework. Considering that almost every developing country which liberalised its economy followed a different path of reforms, examining in which countries the financial sector enhances economic growth, becomes more important because it can provide us with evidence as to which liberalisation process is more 'appropriate'.

One of the adverse effects of liberalisation may be increased volatility in the stock market. Several of the developing countries' stock markets have offered very high returns compared to developed countries. This was one of the 'pull' factors which attracted foreign investors [e.g. Gooptu (1993)]. However, the emerging stock markets (ESMs) are very volatile. It became therefore, very important for institutional investors to know when



to pull out of a market. The sudden inflow and outflow of funds in these countries may have resulted in higher volatility in their stock markets. From a neo-classical perspective, increased investment in the stock market should result in lower volatility because of increased production and dissemination of information. This process should make the market more efficient and thus, less volatile. Keynesians [e.g. Singh (1997)] argue that opening the developing stock markets to foreign investors will transform them into casinos and increase volatility. The increased volatility could damage the growth of the economy because it will become more unstable. Another view is provided by Lamoureux and Lastrapes (1990a) who argue that volatility may increase as a result of more information production. In other words, inactive stock markets will become active in pricing assets, and therefore more efficient. So, the increased volatility should not have an adverse effect on the economy.

There are very few empirical studies examining whether volatility increased in developing stock markets after they opened to foreign investors and they present contradictory results. A study by Richards (1996) shows that volatility actually fell after liberalisation while studies by Aitken (1996) and Grabel (1995) show that volatility increased. A problem with some of these studies is that they use static models to estimate volatility, and the cut off periods do not correspond to actual periods of transition.

Another issue concerning liberalisation in developing countries is the effect of the reform policies on the integration of the ESMs. Financial liberalisation could in principle enhance integration thereby assisting stock market and economic development. The only factor which should cause rates of return to differ across stock markets should be their individual risk. Integrated national stock markets should offer a common reward for the same risk [Bekaert (1995)]. If national stock markets are well diversified and perfectly integrated then similar assets should offer similar rewards. Stock markets which open up to foreign competition should follow a common trend with other open national stock markets in the long run, as a result of increasing integration [Kasa (1992)].



## **1.2. Research Objectives**

This thesis aims to empirically provide answers to the following questions:

- i) Has stock market development assisted economic growth in developing countries?
- ii) Has the volatility of developing stock markets increased following the opening up to foreign investors?
- iii) Have the national ESMs become more integrated after liberalisation?

The first question refers to the effect of the banking sector and the stock market on the economic growth of developing countries. We examine if there is a positive relationship between the two financial sectors and the economy. We also examine if this relationship is bi-directional. This is particularly important because it can give us an insight on the dynamics within an economy. It can also help us understand better the 1997 crisis of the South East Asian economies. For example, in South Korea, the financial market was used to provide finance to the *chaebol*, the big conglomerates which were the base of the South Korean 'economic miracle'. To this end, the financial sector was never allowed to develop based on market forces. It was always under the guidance of the Ministry of Finance. Under these circumstances, we should expect that the financial sector does not develop with the economy. This can have a detrimental effect on an economy, as it became apparent in 1997. The countries for which this hypothesis is tested are: Chile, India, Mexico, South Korea and Taiwan.

The second question is rather straightforward. Volatility is examined before and after important liberalisation policies were introduced in selected developing countries. We examine if volatility changed, and if it did, how it changed. These countries are: Argentina, Chile, India, Mexico, Pakistan, Philippines, South Korea and Taiwan.

The third question refers to the integration of selected developing stock markets during the 1980s and 1990s. This is the period when most liberalisation policies were introduced in most developing economies. The countries in our sample are: Chile, India, Mexico, Pakistan, Philippines and South Korea.

The contribution of this thesis to the economic literature is to provide additional evidence concerning the above questions. All three issues have been barely examined, as we shall see in chapter 3, where we review the existing literature. Also, most of the few studies in the area suffer from problems which the methodologies we use, overcome.

### *1.3. Structure of the thesis*

The thesis is organised as follows: the second chapter is an overview of the development of Latin American and Asian financial markets and economies. The first part of the chapter, presents data on the foreign investment flows to the two regions as well as data on stock market characteristics for the two regions, such as market capitalisation and liquidity. The second part of the chapter, discusses the social, political and economic developments in Chile, India, Mexico, South Korea and Taiwan, during the last twenty years. In the discussion there is an explicit reference to the development of the banking sector and the stock market(s) in these countries.

The third chapter discusses the theoretical background of financial liberalisation and stock market development. We begin by presenting a simple schematic outline of the main theoretical approaches. Then we consider the implications of each one of these approaches for financial liberalisation and discuss the main theoretical advances in this area.

The fourth chapter reviews the academic literature on emerging economies. The literature review does not cover only the issues examined on this thesis. It is a summary of the research carried out in most topics concerning emerging economies. The literature review is rather general, in order to establish a better understanding of the functioning of the stock markets in emerging economies, the special issues concerning them and the developments of the academic research on this area. The fifth chapter discusses the methodologies we utilise in each of the following chapters and the data we use.

In the sixth chapter we empirically examine the relationship between the financial sectors and the real economy in selected emerging markets. The countries examined were

especially chosen because they cover a range of liberalisation paths and other characteristics. Chile and Mexico liberalised their economies to a very high degree. Chile, however, kept one restriction: repatriation of foreign funds was not allowed freely. This shielded the country from sudden outflows which other countries experienced. India implemented some reforms, but it did not go as far as the other countries in the sample. The Indian economy is still protectionist - up to a certain degree. South Korea is a particular interesting case because its development has always baffled advocates of the free market. It is a heavily regulated economy with respect to foreign investment, and restrictions on the capital account would change depending on the country's needs; when foreign reserves accumulated, the capital account was liberalised, and when foreign reserves fell, the capital account liberalisation was reversed. Taiwan is another interesting case because of its spectacular development and the structure of its market. Unlike South Korea, the Taiwanese market consists of thousands of small businesses, so in effect the financial sectors' development could be quite different from other countries. The sample period differs according to data availability. It covers a period from the late 1970's to 1997. To examine the relationship between the financial market and the economy we use cointegration analysis, in which the banking sector and the stock market are explicitly modelled.

The seventh chapter examines the effect of financial liberalisation on stock market volatility. We utilise two methodologies. The first is a generalised autoregressive conditional heteroscedasticity process (GARCH). The ARCH family processes have been proved to be very effective tools for modelling volatility. A feature of the GARCH process is that it is dynamic and allows us to examine the changes in the nature of volatility as well as the changes in volatility *per se* (which is the unconditional volatility implied by the process). We estimate the GARCH process for each country's stock market returns before and after liberalisation, and compare the results. The second methodology, utilises the exponential GARCH (EGARCH) process, from which we derive the news impact curves for each country before and after liberalisation. The news impact curve relates current volatility to past shocks. Changes in the curves will provide evidence about the change in volatility after liberalisation.



In the eighth chapter, we conduct two tests to examine integration across national ESMs. First we use cointegration analysis to examine if the indexes of selected ESMs follow a common trend before and after liberalisation. Cointegration implies integration across the markets. The second test examines integration with respect to risk. We estimate the financial risk premium for selected developing countries, for every year from 1984 to 1996 (except from South Korea where the sample ends in 1994 due to data unavailability). To estimate the financial risk premium, we utilise the options pricing formula for European options, to calculate the market value of the countries' residents equity. In other words, we value the countries' foreign debt in the same way as corporate debt. Using the results from the options pricing formula, we can calculate the cost of debt and then the financial risk premium. This methodology uses macroeconomic variables specific to each country, so that the result is based on the each country's economic situation. Since we estimate the financial risk premium for every year during the sample period, we can see how it changes during the liberalisation period in each country.

Finally, the ninth chapter discusses the findings of this thesis and draws some conclusions. It also identifies areas for future research.

## **CHAPTER 2: THE EMERGING MARKETS - AN OVERVIEW**

### **2.1. Introduction**

At this stage, it is useful to present some information about the Asian and Latin American financial markets. The aim of this overview is to provide the reader with information about the functioning and some characteristics of the markets involved in the analysis. This should help our understanding of some of the problems and some of the issues involved in emerging financial markets. It should also help to put the results presented in the next chapters into perspective. This chapter is divided in two parts. The first part presents some aggregate statistics on the development of direct and indirect investment in Asian and Latin American countries. The second part is a profile of the social, economic and political recent history of some of the countries in our analysis.

### **2.2 Stock Markets in Emerging Countries**

Since the early 1980s there has been a tremendous increase in the amount of investment flows to emerging economies. Historically, the biggest proportion of investment to emerging markets was in the form of debt. As we see in Figure 2.1, during the early 1980s net investment in equity to all emerging markets was very small. In 1984, private debt flows to emerging economies was \$25.9 billion while equity flows was only \$0.15 billion. By the end of the 1980s this trend had began to reverse. In 1993, net equity flows to emerging markets was \$45 billion, \$1 billion more than private debt. After 1993, private debt flows were more than portfolio investment but, the amount of money entering emerging markets had increased dramatically. By 1997, net private debt flows reached \$103.2 billion, a fourfold increase since 1984. Net equity flows in 1997 were \$32.5 billion; increased by more than 2,000% since 1984.



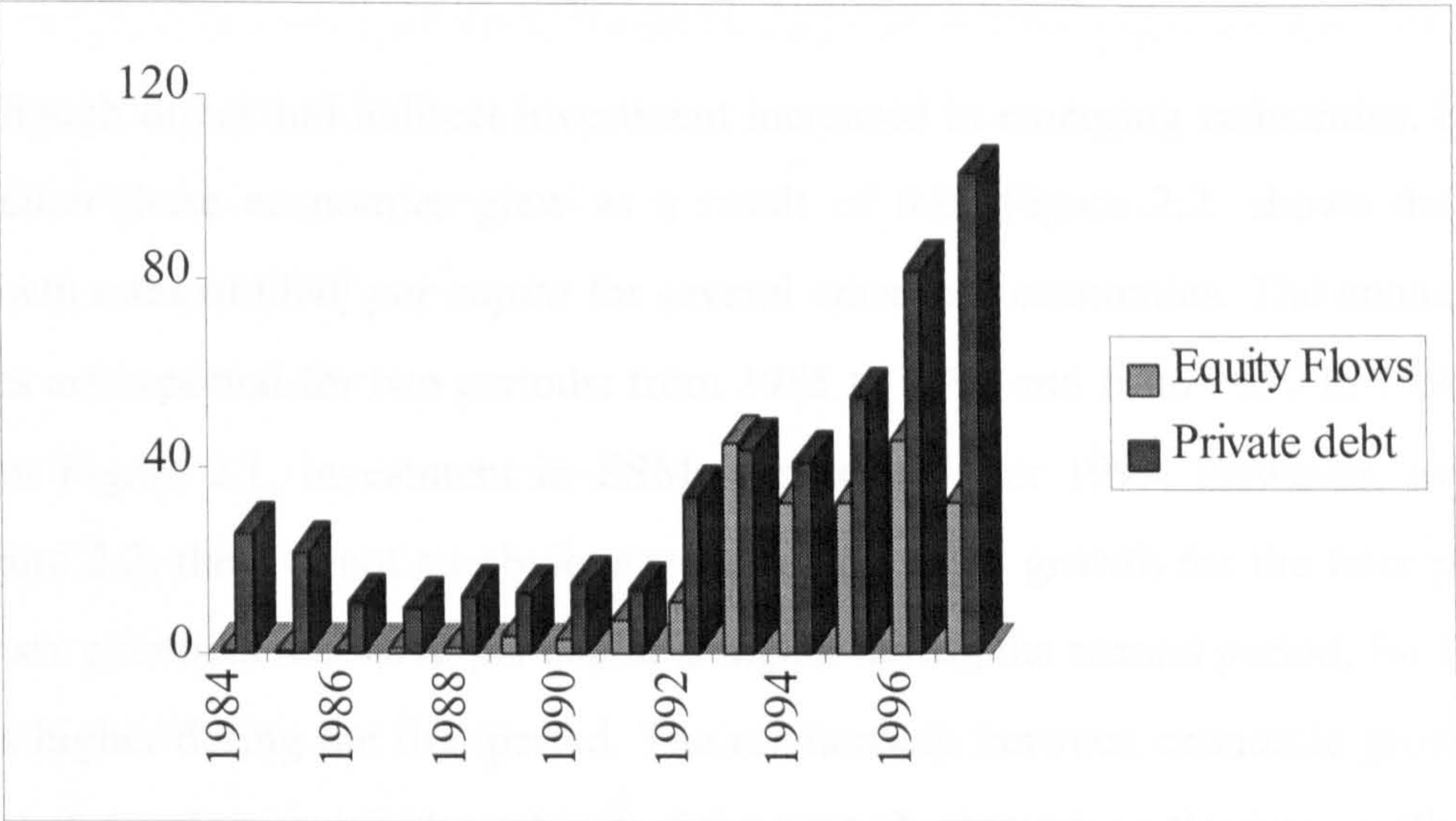


Figure 2.1. Net private debt and portfolio investment flows to emerging markets (billion of dollars).  
*Source:* IFC Emerging Stock Markets Factbook

One of the reasons ESMs became very attractive to investors was the extraordinary returns they offered. Several of the ESMs offered annual returns of 100% or more in dollar terms. In 1989, the Argentinean, the Taiwanese and the Thai stock market indexes increased by more that 100% in dollar terms. Obviously, this was a great opportunity for investors who could predict which markets would be the best performers.

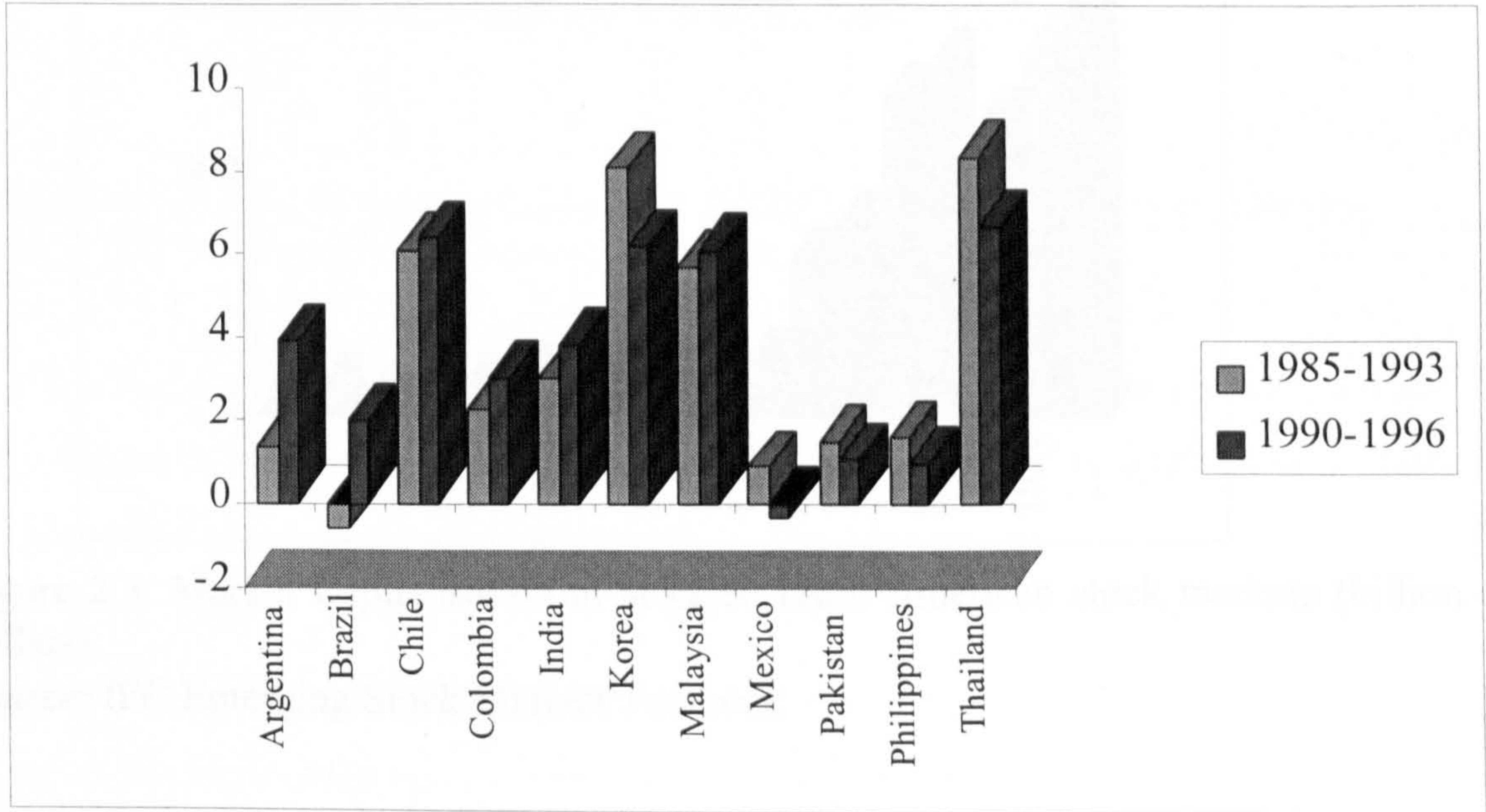


Figure 2.2. Annual real growth in GNP per capita for selected emerging markets.  
*Source:* IFC Emerging Stock Markets Factbook



Although direct and indirect investment increased in emerging economies, it is not clear whether these economies grew as a result of this. Figure 2.2. shows the annual real growth rates of GNP *per capita* for several emerging economies. The annualised growth rates are reported for two periods: from 1985 to 1993 and from 1990 to 1996. As we see from Figure 2.1, investment in ESMs picked up after 1993. However, as it shown in Figure 2.2, there is not an obvious trend of real GNP growth for the later period. While for six countries real GNP per capita is higher during the second period, for five countries it is higher during the first period. The relationship between economic growth and stock market development is the subject of the next chapter where the issue will be examined empirically.

### 2.2.1. Latin American Economies

Several Latin American economies liberalised their stock markets in order to attract foreign capital. During the early 1990s most Latin American stock markets became very active. Figure 2.3 shows the market capitalisation of Latin American<sup>1</sup> stock markets from 1980 to 1997.



Figure 2.3. Market Capitalisation of selected Latin American stock markets (billion of dollars).

Source: IFC Emerging Stock Markets Factbook

<sup>1</sup> The countries included are: Argentina, Brazil, Chile, Colombia and Mexico.



Up to 1990, the value of stock traded in Latin American countries was lower than \$100 billion. During the 1980s, the highest value of the Latin American stock markets was in 1989 when it reached \$81.7 billion. In 1991, the stock market capitalisation of these countries almost tripled (it went from \$67.2 billion in 1990 to \$191.3 billion at the end of 1991). Since then the value of stock traded in these markets has continue to increase rapidly. In 1997, the stock market capitalisation of Latin American countries had reached \$562.8 billion; about 15 times up since 1980 when it was \$37 billion.

Although the value of the listed stock increased, the number of the companies listed did not. As we see from Figure 2.4, the number of listed companies in the sample countries actually fell. In 1980, there were 1,228 companies listed on Latin American stock markets. In 1983 their number was 1,120 and since then their has been a minor increase.

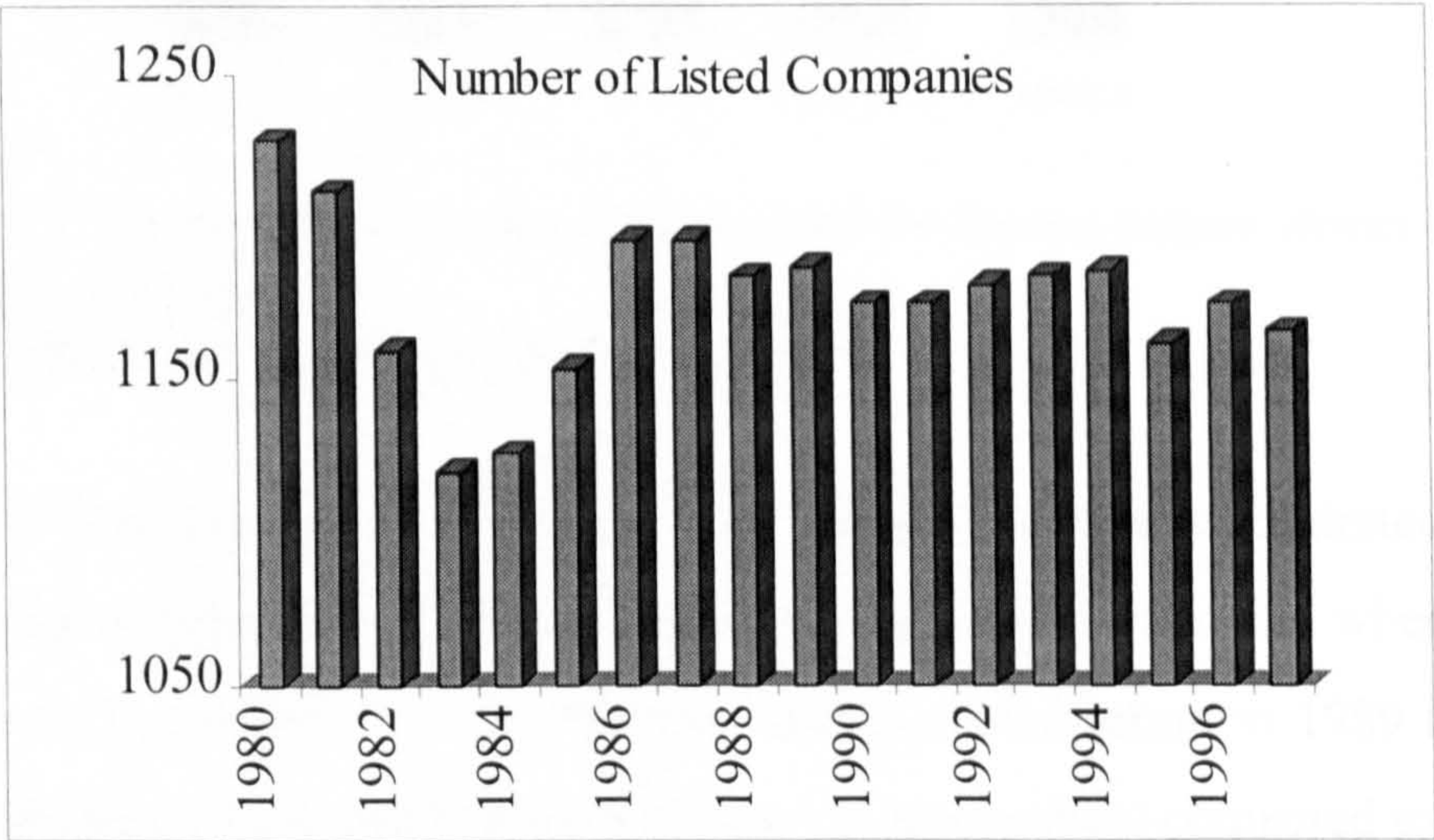


Figure 2.4. Number of listed companies in selected Latin American stock markets.  
*Source:* IFC Emerging Stock Markets Factbook

In 1997, there were 1,165 companies listed on Latin American stock markets. Therefore, the increase in stock market capitalisation was not the result of an increase in the number of companies listed on these stock markets.

The increase in the market capitalisation of these countries came in two ways: first, the value of the companies which were listed increased several times. Second, most of the Latin American countries in the sample implemented privatisation programmes as a result of which, several public utility companies were listed on the stock market. These



companies - most of which remained state controlled - are considered giants compared to other companies in these countries. The public utility companies and a handful of other very big companies account for a large part of the capitalisation in Latin American stock markets. Figure 2.5 presents the share of market capitalisation held by the ten largest stocks in each country, in 1989 and in 1997.

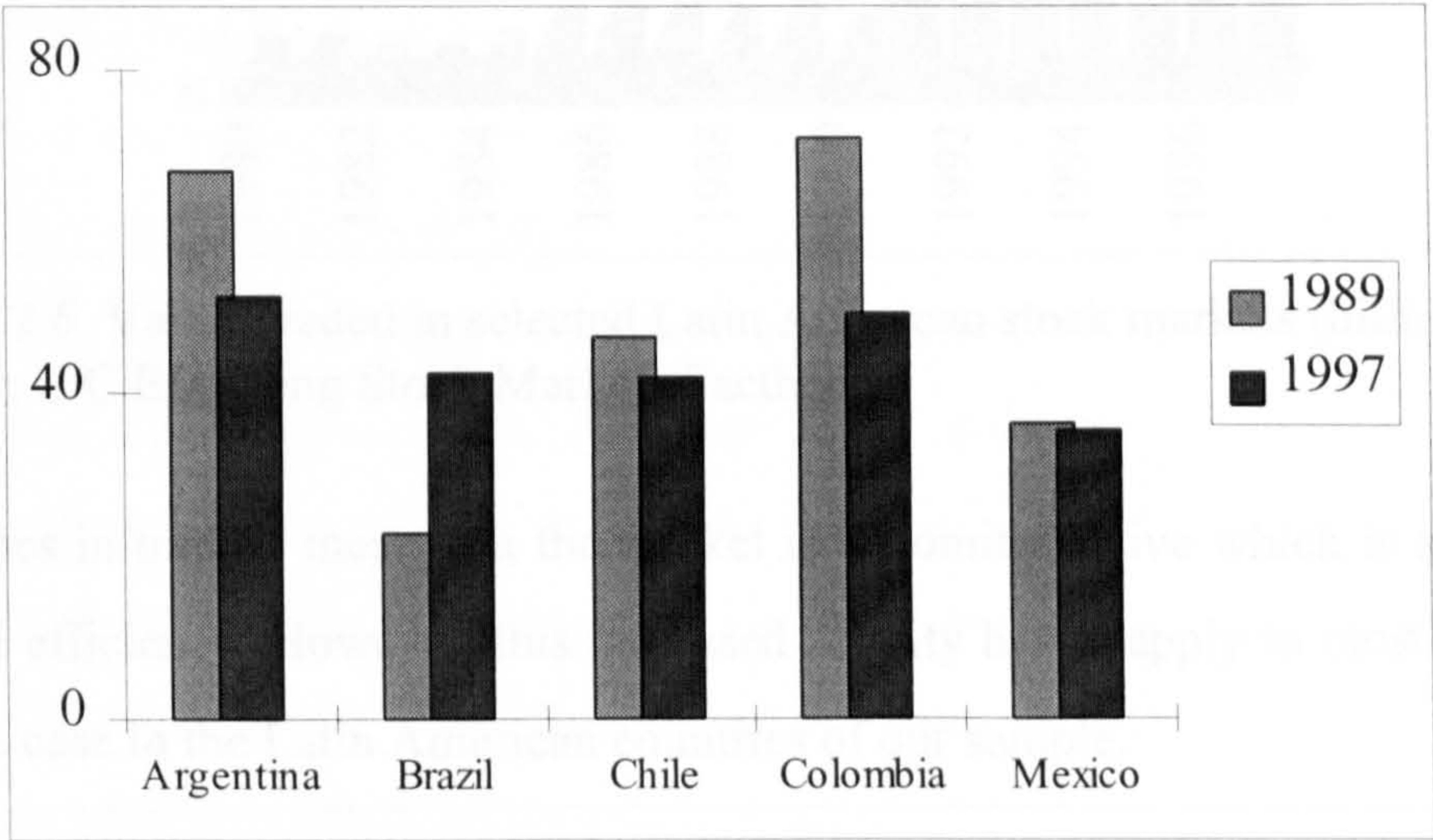


Figure 2.5. Share of market capitalisation held by the ten largest stocks in selected Latin American countries.  
*Source:* IFC Emerging Stock Markets Factbook

In all the countries except from Brazil, the market was less concentrated in 1997 than in 1989. The biggest change in concentration happened in Colombia where the ten largest stocks accounted for 71.7% of the total market capitalisation in 1989 but for 49.8% in 1997. However, these markets are still heavily concentrated compared to developed stock markets (in 1989 the same figures for the UK and the US were 21.9% and 13.7% respectively).

The development of the Latin American stock markets resulted in an increase in trading, as shown in Figure 2.6. During the 1980s trading in Latin American stock markets was relatively low. For that decade, the highest value traded for one year was in 1986, when \$33.3 billion were traded. In 1991, there is a sharp increase in trading which continues until the end of the sample period. In 1997, value traded stood at \$288.9 billion.



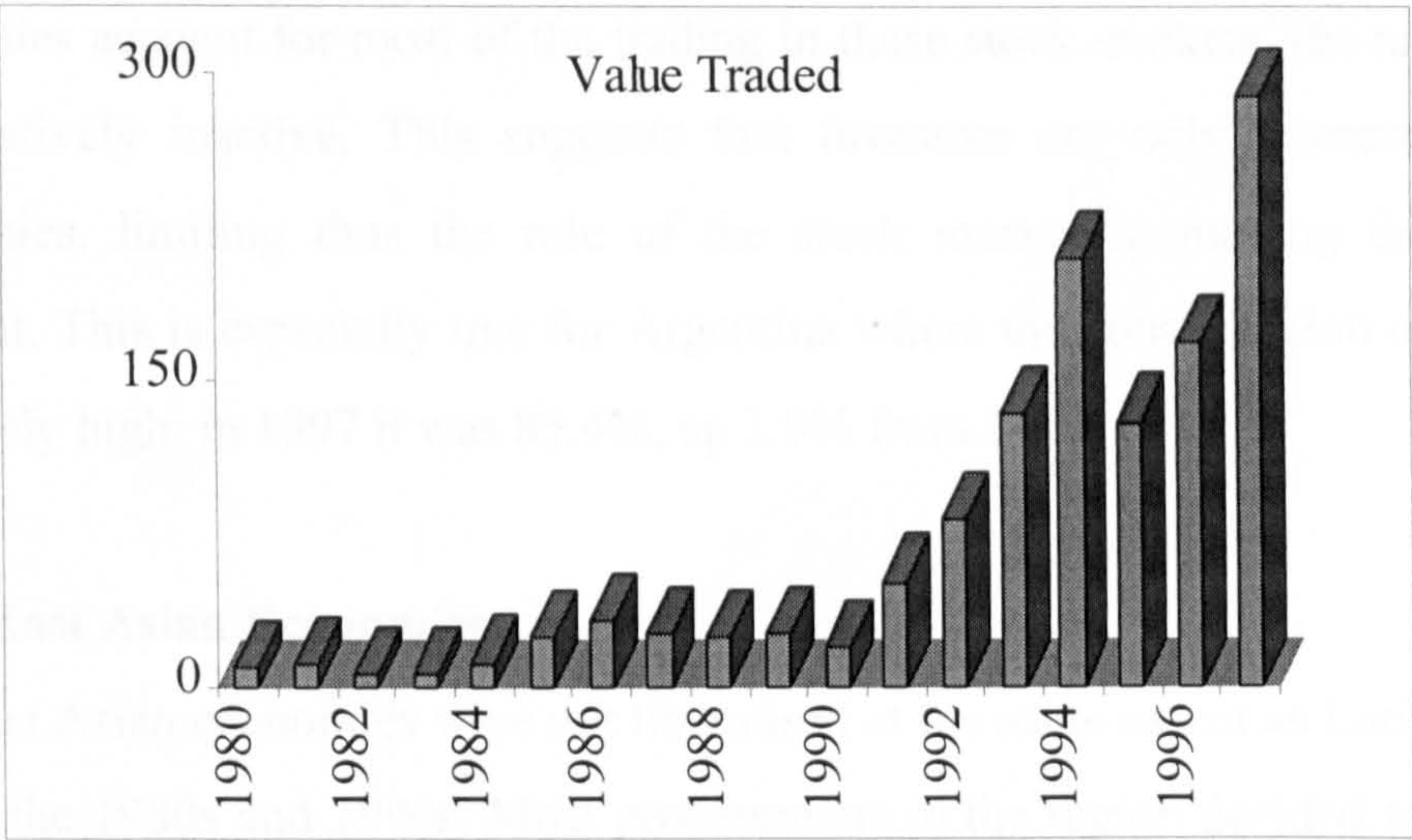


Figure 2.6. Value Traded in selected Latin American stock markets (billions of dollars).  
*Source:* IFC Emerging Stock Markets Factbook

Increases in trading mean that the market is becoming active which is a prerequisite for market efficiency. However, this increased activity has to apply to most stocks, which is not the case in the Latin American countries of our sample.

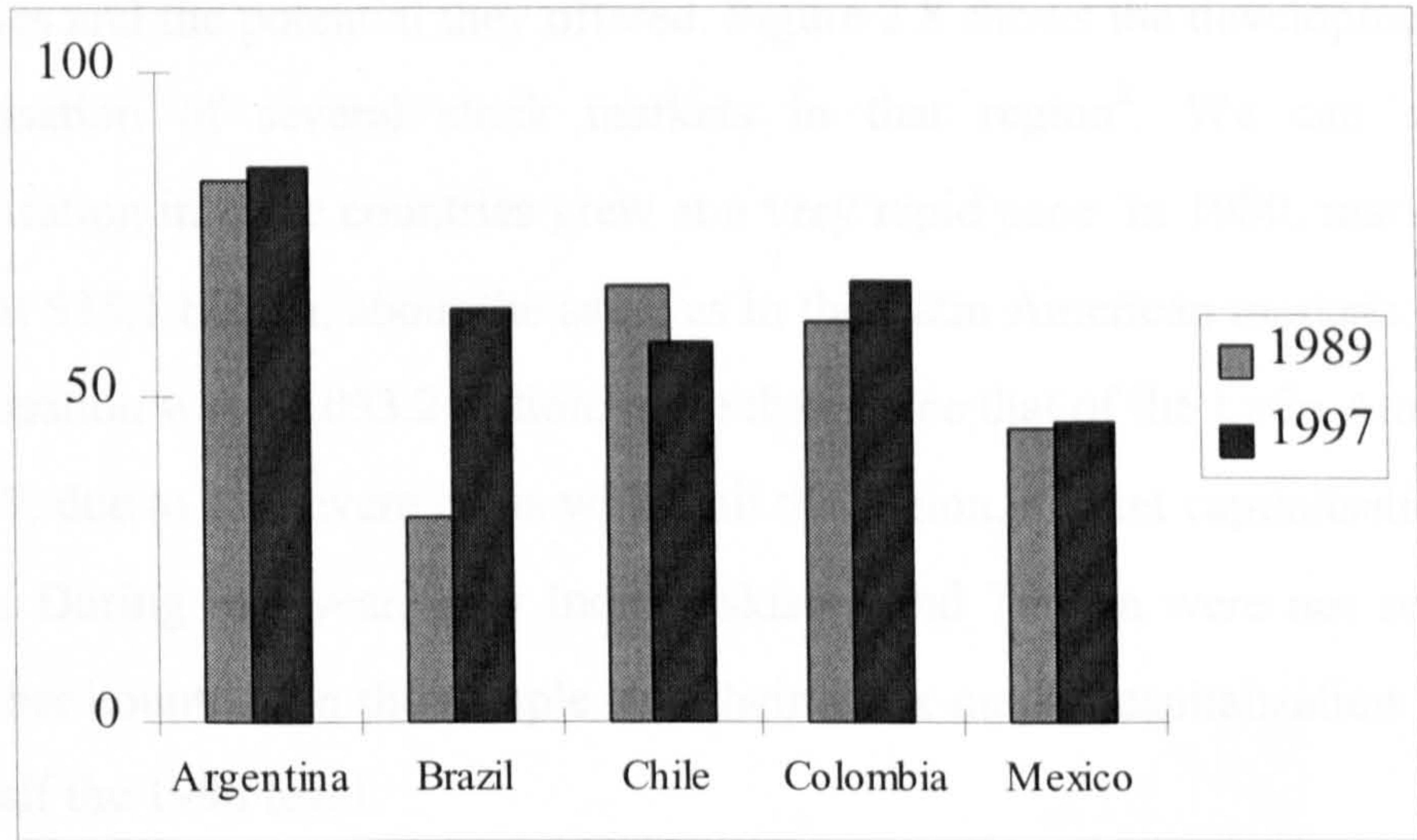


Figure 2.7. Share of value traded held by the ten most active stocks in Latin American countries.  
*Source:* IFC Emerging Stock Markets Factbook

Figure 2.7 shows the share of value traded held by the ten most active stocks. In all countries the ten most active stocks accounted for more than 50% of value traded in 1997, except for Mexico where they accounted for 45.6%. In most countries the concentration of value traded increased. While in most countries it increased by a little, in Brazil it went up by 32.7%. Such heavy concentration means that although the markets are becoming more active, not all companies benefit from that. Since a handful of



companies account for most of the trading in these stock markets, the majority of stocks are relatively inactive. This suggests that investors are only interested in very few companies, limiting thus the role of the stock market in making the markets more efficient. This is especially true for Argentina where the concentration of value traded is extremely high: in 1997 it was 85.4%, up 1.9% from 1989.

### **2.2.2. East Asian Economies**

The East Asian economies were not liberalised at the same extent as Latin American ones during the 1980s and 1990s. Most governments in the region decided to keep several of the restrictions on foreign investment and capital flows in order to control their economies and avoid shocks. All East Asian economies took some steps towards liberalisation, but the process was slow and frustrated Western investors who wanted freedom of movement for their capital. However, equities in these markets were in great demand until the 1997 crisis because of the rapid growth rates experienced by these countries and the potential they offered. Figure 2.8 shows the development of the market capitalisation of several stock markets in that region<sup>2</sup>. We can see that market capitalisation in these countries grew at a very rapid pace. In 1980, market capitalisation stood at \$35.1 billion, about the same as in the Latin American markets. In 1996, market capitalisation was \$1,033.2 billion, more than twice that of the Latin American countries. In 1997, due to the severe crisis which hit the region, market capitalisation fell to \$617.5 billion. During that year, only India, Pakistan and Taiwan were not seriously affected. The other countries in the sample saw their stock market capitalisation shrinking to less than half the 1996 level.

---

<sup>2</sup> Countries included are: India, Korea, Malaysia, Pakistan, Philippines, Taiwan and Thailand.



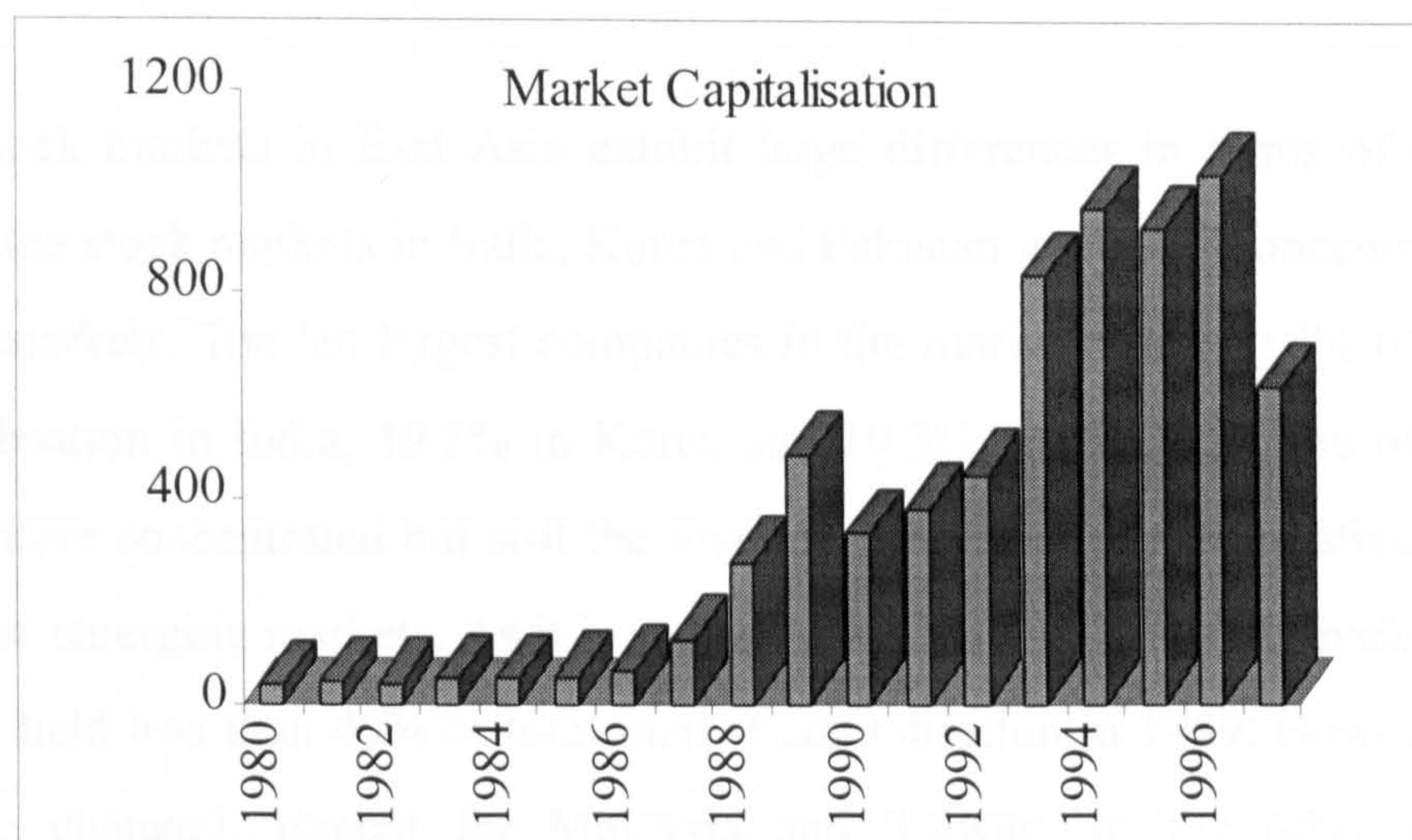


Figure 2.8. Market Capitalisation of selected East Asian stock markets (billion of dollars).  
*Source:* IFC Emerging Stock Markets Factbook

Stock prices in several of these countries were increasing rapidly. Taiwan and Philippines have repeatedly being referred to in the press as casinos. The potential for the companies in these countries was to attract capital (foreign or domestic) relatively cheap. This resulted in a large increase in the number of listed companies in the stock markets of the region. As we can see from Figure 2.9<sup>3</sup>, the number of listed companies grew steadily at a fast pace since the late 1980s. In 1980, there were 1,222 companies listed on East Asian stock markets. By 1997, that figure had almost tripled; there were 3,321 listed companies in the region.

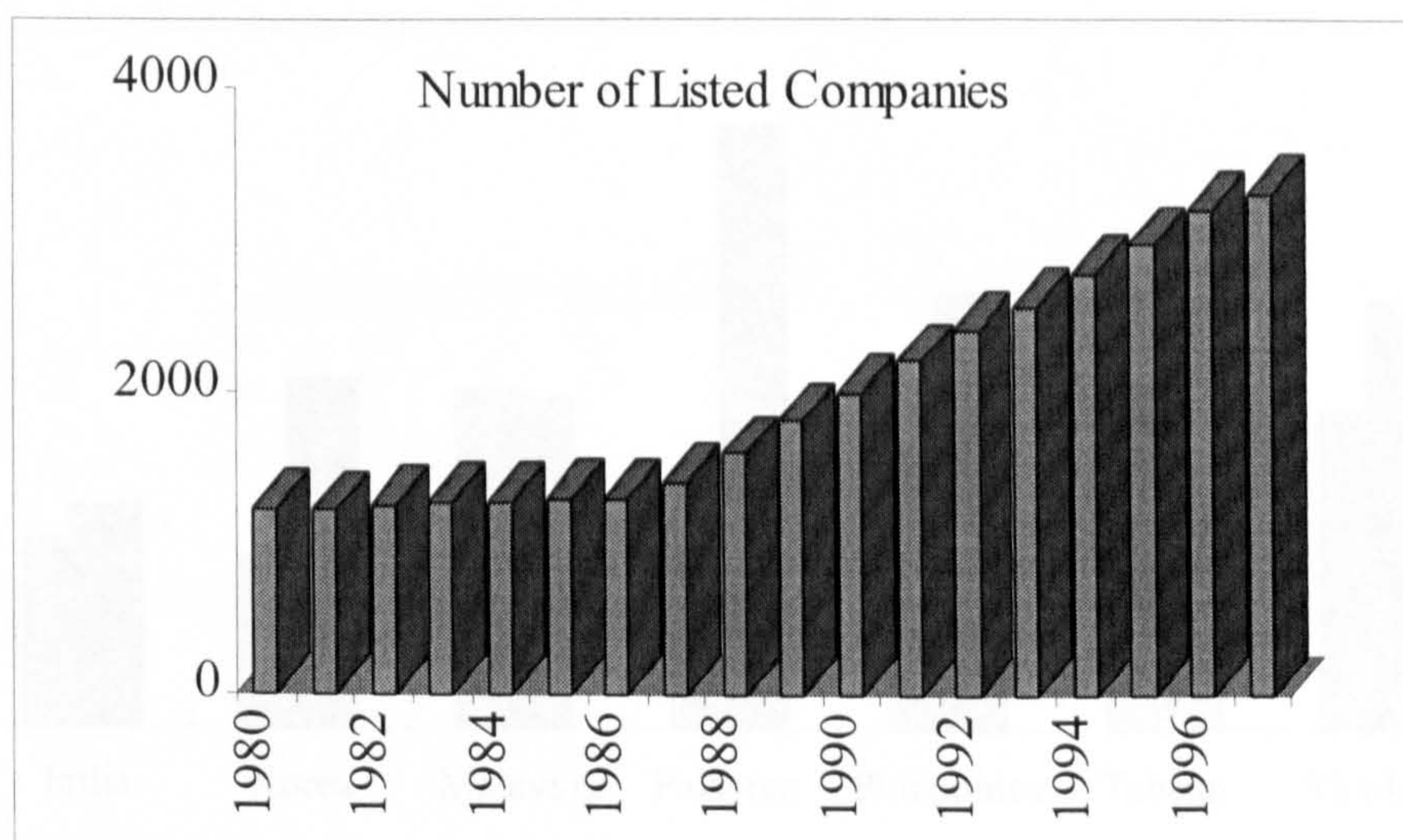


Figure 2.9. Number of listed companies in selected East Asian stock markets.  
*Source:* IFC Emerging Stock Markets Factbook

<sup>3</sup> In Figure 2.9, India is not included.



The stock markets in East Asia exhibit large differences in terms of concentration. In 1989, the stock markets in India, Korea and Pakistan were less concentrated than the UK stock markets. The ten largest companies in the markets held 20.8% of the total market capitalisation in India, 19.2% in Korea and 19.3% in Pakistan. The other four markets were more concentrated but still the level of concentration was relatively low compared to other emerging markets. As it is shown in Figure 2.10, in every market, the ten largest stocks held less than 40% of total market capitalisation in 1989. However, by 1997, this picture changed. Except for Malaysia and Taiwan, in the other countries market concentration increased. The biggest change occurred in Pakistan where the ten largest stocks in 1997, held 66.8% of total market capitalisation; the Pakistani stock market changed from being a very low concentrated market to becoming a very highly concentrated market. Considering that the number of listed companies increased, it seems strange that market concentration should increase, too. The explanation is probably the same as in the Latin American countries. Part of the liberalisation process was the privatisation of public utilities, which compared to other companies in these markets, are giants. Once public utility companies are listed on the stock market, they dominate it. That is why market concentration increased in these countries although more and more companies were seeking a listing on the stock market.

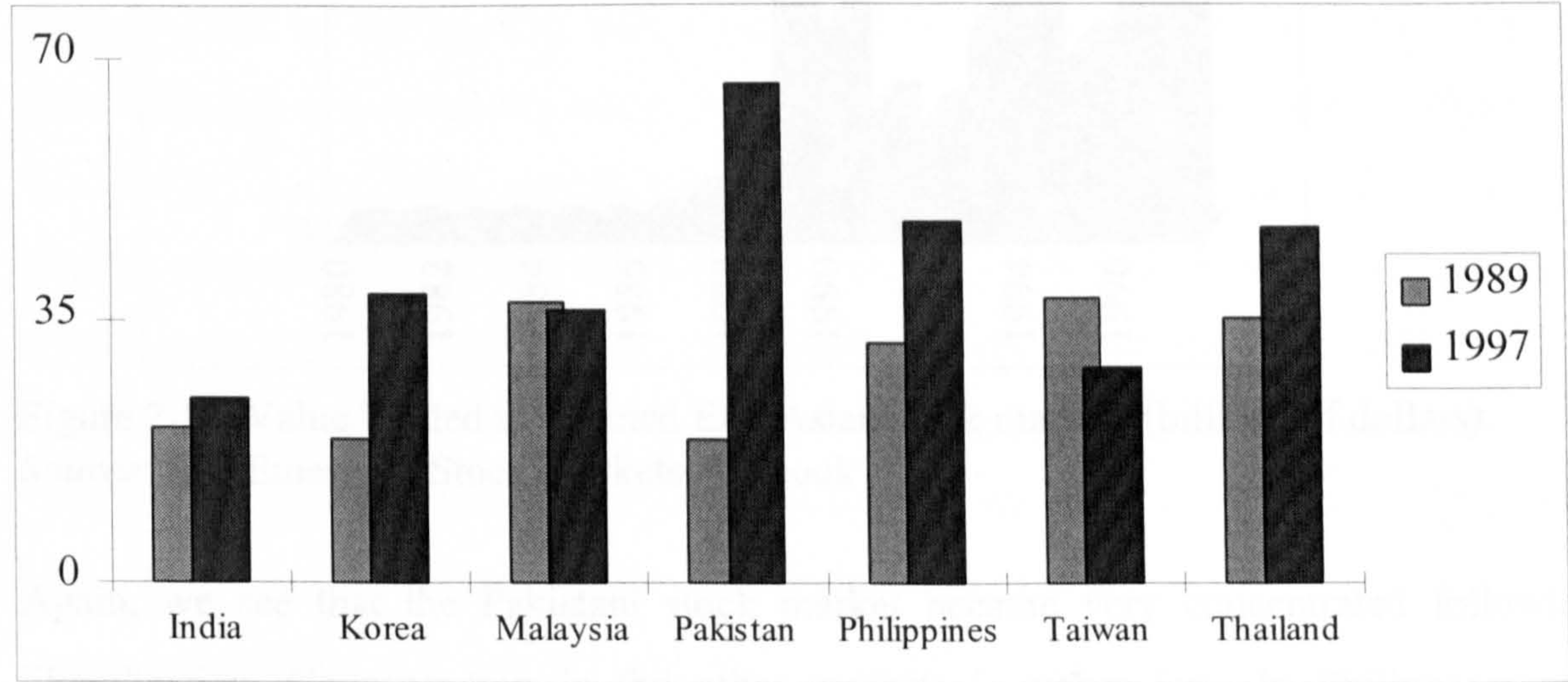


Figure 2.10. Share of market capitalisation held by the ten largest stocks in selected East Asian countries.

Source: IFC Emerging Stock Markets Factbook



As it is expected, stock market development also increased the value traded in these markets. This increase is shown in Figure 2.11<sup>4</sup>. In 1980, only \$12.6 billion worth of shares were traded in the East Asian countries of our sample. This is roughly the same amount as for Latin American countries the same year. For four consecutive years, from 1986 to 1989, value traded tripled every year. In 1985, value traded was \$16.9 billion; value traded for 1989 was \$1,127.3 billion. Trading in Taiwan accounted for most of this increase. In 1989, value traded in the Taiwanese stock market was \$965.8 billion. Although the other countries in the sample had much smaller amounts of equity traded, trading was steadily increasing in all countries. In 1997, value traded in the region was \$1,711.5 billion; it had increased 136 times since 1980.

The good news for companies is that trading was not very concentrated in a few companies. Only in India and Pakistan is trading very concentrated (Figure 2.12). In 1980, the ten largest stocks accounted for 47.3% of total value traded in India and 18.2% in Pakistan. In 1997, the same figures were 81.1% for India and 90.5% for Pakistan.

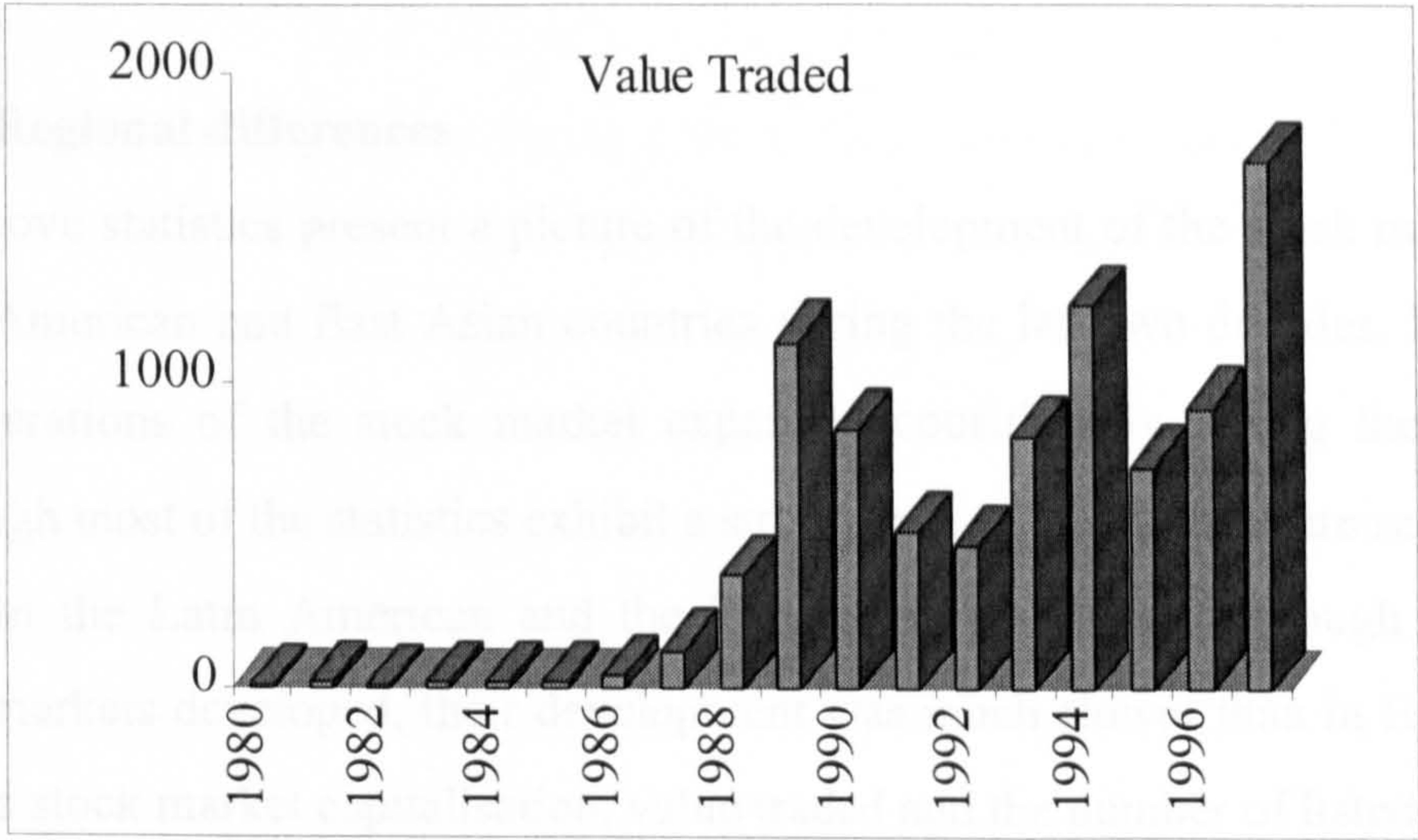


Figure 2.11. Value Traded in selected East Asian stock markets (billions of dollars).  
Source: IFC Emerging Stock Markets Factbook

Again, we see that the Pakistani stock market became very concentrated following liberalisation. Concentration in the other markets is rather low. In Philippines and Thailand the ten largest stocks account for about 35% of equity traded throughout the

<sup>4</sup> In Figure 2.11, Pakistan is not included.



sample period and in the remaining countries trade concentration is around or below 20%. This means that a lot of stocks were very active which is encouraging news for market efficiency<sup>5</sup>.

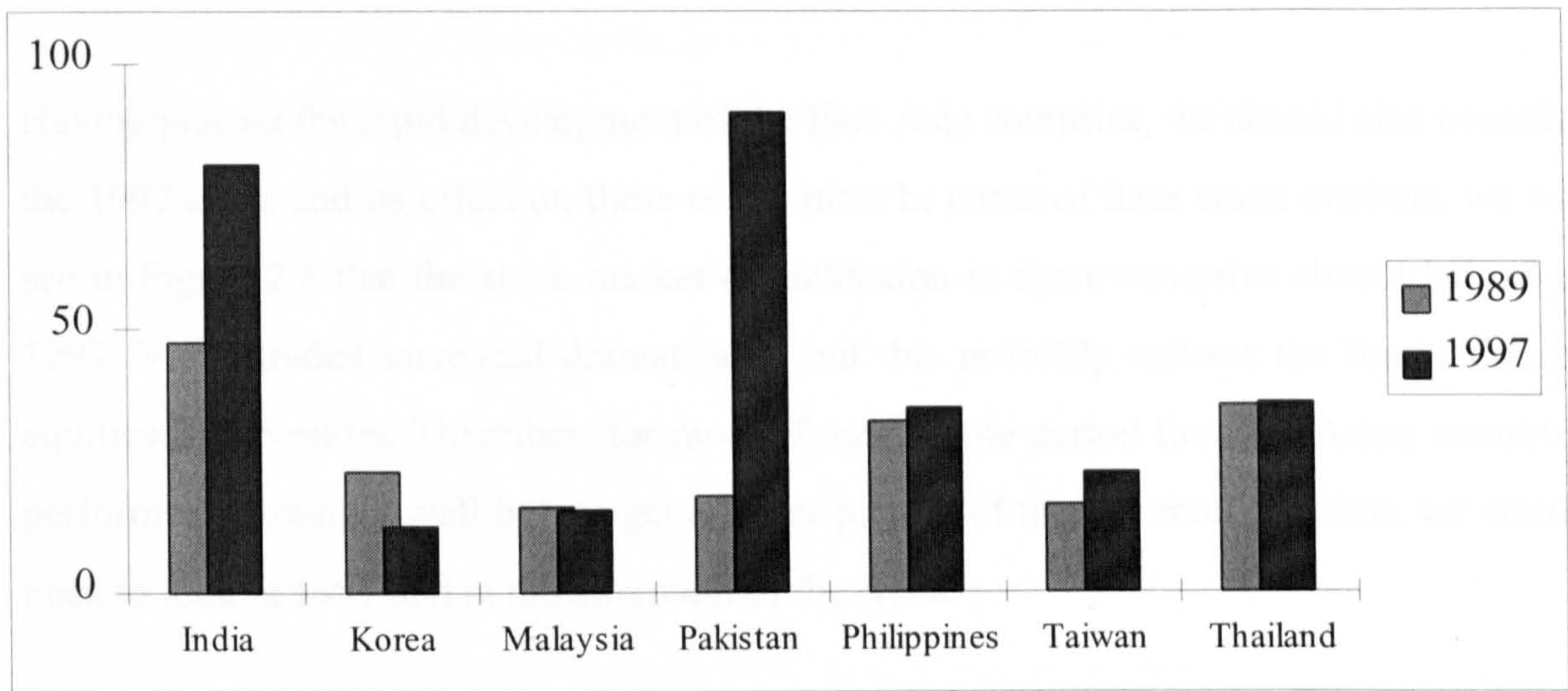


Figure 2.12. Share of value traded held by the ten most active stocks in East Asian countries.

Source: IFC Emerging Stock Markets Factbook

### 2.2.3. Regional differences

The above statistics present a picture of the development of the stock markets in several Latin American and East Asian countries during the last two decades. In every country the operations of the stock market expanded considerably during the sample period. Although most of the statistics exhibit a strong upward trend, there are several differences between the Latin American and the East Asian countries. Although Latin American stock markets developed, their development was much slower than in East Asia. In both regions stock market capitalisation, value traded and the number of listed companies were roughly in the same level in 1980. By 1997, market capitalisation in East Asian countries was 10% more than in Latin America. The difference was only 10% because of the 1997 crisis. In 1996, the same percentage was 250%. Value traded in 1997 in East Asia was about 6 times that in Latin America and the number of listed companies was 3 times more. These differences reflect the different growth rates experienced by these countries.

<sup>5</sup> Active trading does not imply efficiency but activity in the stock market is one of the necessary conditions for market efficiency.



Most of the Asian ‘tigers’ were growing at rates of 6% per year in real terms. The Latin American countries failed to reach such growth levels (except a few, like Chile). For most of the sample period these countries were trying to overcome the problems generated during the 1970s which resulted in the debt crisis at the beginning of our sample period.

Having praised the rapid development of the East Asia countries, we should also consider the 1997 crisis and its effect on these economies. In terms of their stock markets, we can see in Figure 2.8 that the stock market capitalisation in these countries almost halved in 1997. Value traded increased dramatically, but this probably reflects the liquidation of equities by investors. Therefore, for most of our sample period the East Asian countries performed extremely well but, to get a better picture of their current situation we would need to look at 1997 and at the aftermath of the crisis.

## **2.3. Countries profile**

### **2.3.1. Chile**

In 1974, the Pinochet regime started a big scale liberalisation. Banks were denationalised, interest rates were freed, reserve requirements were scaled down, preferential credit was drastically reduced and the refinancing rate of existing credit was raised to market level<sup>6</sup>. The regime increased the role of the markets and open the economy to foreign trade. It also introduced a tax reform and reduced government spending<sup>7</sup>. In 1978, the exchange rate became the main instrument of stabilisation and an active pre-announced crawling peg was introduced. By June 1979, the rate of the crawl became zero and the peso was fixed to the dollar. Because domestic inflation was higher than international inflation, the peso appreciated greatly. Furthermore, wage indexation was based on lagged changes of the CPI so, because of decreasing inflation real wages increased. The difference in domestic and international interest rates, accelerated demand for foreign borrowing. In 1982 capital inflows were reduced and the overvalued peso resulted in the collapse of the

---

<sup>6</sup> For a review of the economic reforms in Chile during that period see: Corbo (1993) and Corbo and Fischer (1993)

<sup>7</sup> For a discussion on the economic policies adopted in Chile during 1974-84 see: Corbo V. in Corbo and DeMelo (1985).

fixed exchange rate system and a 14.3% drop of GDP. In June 1982, the peso depreciated by 18% against the dollar and a new system pegged it against a basket of currencies. The government announced a further 0.8% monthly devaluation with respect to the basket of currencies for the next 12 months. Also, the wage indexation was suspended.

A casualty of the 1982 crisis was the banking sector. Prior to the crisis, the government had left the banking sector to its own devices. It offered no protection in case of a banking run or bankruptcy. Since the financial system was liberalised the debt accumulated by the private sector grew dramatically. The ratio of debt to the banking system increased from 5% of GDP in 1974 to 61.7% in 1982. After the crisis, most banks were unable to service their foreign debt and were bailed out by the government. The government provided them with emergency loans and subsidised credit and the Central Bank purchased some of their risky loans with the provision that the banks will buy them back in 10 to 50 years. The Central Bank also provided interest rate guidance and in whole the sector was regulated and slowly recovered. Competition in the banking sector was encouraged and foreign banks could compete equally with the local banks. By 1988 there were 39 commercial banks in Chile, of which 23 were foreign. During the 1990s different sources of finance had developed in the country (e.g. private pension funds, life insurance companies and shares issuance either locally or in the US in the form of American Depository Receipts). The trend in that period was mergers between banks and focus on other areas of business (e.g. consumer credit and housing loans).

The stock market in Chile developed fast in the decade after the crisis. Several factors contributed to that: diminished political risk after a peaceful transition from dictatorship to democracy, persistent economic growth, decreasing inflation and a decreasing foreign debt which had been rescheduled. During the late 80's and early 90's the stock market was performing very well. Although listing on the Bolsa increased, it remained heavily concentrated. In 1996, the electricity and telecommunications companies accounted for two thirds of the stock market capitalisation.

Foreign investors could not liquidate their stocks and take them out of the country whenever they pleased. From the foreign funds entering the country, 30% had to be

deposited in the Central Bank for one year interest free; this served as a tax on short term investments. This “tax” was lowered to 15% in 1997. This restriction was part of a wider set of restrictions on the capital account - which have been eased but not abolished - to protect the country from capital flight after the 1982 crisis.

Since the crisis, the Chilean economy grew fast due to several reasons. Foreign investors have been welcomed in the country. Legislation gave foreign investors and domestic businessmen equal rights so foreign investors could compete on equal terms with the locals. Also, the government tried to pursue export led growth. To that end, Chile entered or still tries to enter several free trade agreements (NAFTA, Mercosur, APEC and a trade agreement with the European Union), as well as bilateral agreements (with Argentina, Bolivia, Colombia, Mexico, Peru, Venezuela and others). While copper accounted for more than 70% of exports in the 1970s, it accounted for about 40% of exports a decade later. As a result, the trade balance became healthier.

The government also managed to reduce the fiscal deficit to negligible amounts and generate a fiscal surplus every year after 1989. The tight fiscal policy was good for the economy although it had a social cost. The sectors affected the most were health and education. Monetary policy is set by the Central Bank which was given full independence in 1989. The Pinochet regime followed an extensive privatisation scheme which was continued by the socialist government elected in 1989. One of the most famous reforms was the privatised pension funds designed to free the government from paying pensions. It is not clear yet if this controversial scheme is beneficiary for the country or not. The policies adopted by the military regime were continued by the 1989 elected government with few changes (the major change was the increase in social spending to provide much needed improvement to the health and education sectors).

The economic success of Chile was brought to a halt in 1997 because of the Asian crisis. The country was well equipped to absorb external shocks thanks to prudent fiscal management, tight banking supervision, capital controls to avoid massive capital outflows and a stabilisation fund created by gains from high copper prices standing at \$1.85 billion in early 1998. However, 33% of its exports went to Asia. Although only



10% went to countries which were in deep trouble, the crisis reduced demand for all goods. The price of copper fell from \$1.19 a pound in June 1997 to 75 cents in March 1998. The economic slowdown though is seen as a temporary problem. Guillermo Perry, the World Bank's chief economist for Latin America, said that Chile was better placed than any other country in the region to absorb external shocks (Economist, 7 March 1998).

### **2.3.2. India**

When India gained its independence on August 15th 1947 the government introduced a licensing system which dictated how many companies would exist in each industry and how much they produced. Exports were not regarded important as India tried to achieve self sufficiency. Labour laws commanded that employees in large companies (i.e. companies with more than 100 employees) could not be fired without government permission and to keep them in a job, companies could not close down. These are some of the basic features of the socialist system established by Nehru after independence. In 1966 Indira Gandhi became prime minister. She increased price and trade controls, nationalised banks and several industries and squeezed foreign investment. Imports were restricted as well: consumer goods' imports were forbidden and imports of intermediate and capital goods were regulated depending on the nature of each particular good and whether it was available in the country or not.

Since the 1950s, the Indian economy has been growing slowly (what economists call the "Hindu rate of growth"). In 1987, less than 1% of the population were employed in Indian factories (Economist, 9 May 1987). At the end of 1987, there were 160,000 "sick enterprises" in India and their number kept growing. However, they were prohibited from closing down and they were faced with limited options. Takeovers and mergers were tightly controlled and the simplest cases took at least six months to get permission. Asset and land sales were also controlled - and often impossible - and no worker could be sacked. In most cases, problematic companies were kept alive by subsidies which in 1987 accounted for almost 20% of all outstanding loans of India's financial institutions.

India has a poor record of health and education. The level of educated Indians is around 50%, which is one of the lowest in the world. The health sector also suffers: 300,000 children a year die of diarrhoea and in 1994 there was an outbreak of pneumonic plague. The infrastructure is also in need of money. For example, there are daily power cuts all over the country. Although investment is needed in infrastructure, public spending on it is declining. Between 1990 and 1995, central government spending went up by 6% in real terms. Current spending increased by 13% while capital spending fell by 19%.

Political risk is high in India. It has a democratic system, unlike most third world countries, but political scandals and instability is the trend. In 1996, an ex-minister was fined 5 million rupees for fraud and Narasimha Rao, who was an ex-prime minister was charged with criminal conspiracy to cheat a businessman. In 1997, Lallo Prasad Yadav, the ruling party's president, was prosecuted in connection with a racket. Also, several politicians have been assassinated, including Rajiv Gandhi while he was serving as a prime minister.

Although economic conditions in India are better now than four decades ago, India remains one of countries with the worst record in poverty. Determining exactly how many Indians live in poverty depends on who one believes. In 1996, the government estimated that 18.9% of the population lives in poverty but a group of Indian economists estimated the figure to be 37%. If this is the true figure, then more than 300 million Indians are poor.

India also has a long history of violence, both internal and external. India is a country divided by different languages, religions, castes and nationalistic tendencies. Violent confrontations in the country are common. The fighting usually takes place between Hindus and Muslims. Regional chauvinism is another cause of trouble for Indians. One example is the oil blockade from the state of Assam by the United Liberation Front of Assam (ULFA) (Economist, 1 September, 1990). Even more serious are the problems between India and Pakistan. The two countries have already fought three wars since independence and are constantly on the brink of another war over the Kashmir valley. The Indian side of Kashmir is mainly Muslim territory and the Muslims there want either

independence or to join Pakistan. The tension between the two countries escalated in 1998 when both countries carried out nuclear tests.

Traditionally, in order to sustain its policies, the government imposed high tax rates. During Indira Gandhi's early years the top rate of income tax was 97.5%. When tax revenues fell as a percentage of GDP, the government switched to excise duties. The Janata Party government in 1977 began to relax the most stringent controls. Import quotas were replaced with import tariffs which in 1987 were as high as 200%. This provided the exchequer with increased revenues. The liberalisation policies were continued after Indira Gandhi was assassinated. In 1984, her son, Rajiv Gandhi, came to power but his liberalisation policies were inconsistent. However, on the whole the market became more liberal during the early 80's with some industries freed from licences, overall taxes drastically lowered and import of capital goods made easier. Also, foreign investment in India was made easier during that period. However, the rising government's spending forced it to borrow heavily both internally and externally. This raised its international rate of borrowing from 0.25% above LIBOR in 1990 to 3% above LIBOR in 1991. It was downgraded several times by S&P's to a BB-plus. Its foreign debt stood at \$71 billion, with \$5.5 billion being short term debt. The foreign reserves had fallen in April 1991 to \$1.2 billion which was barely three weeks' imports (Economist, 8 June 1991). The government had to accept a loan from IMF and to sell gold abroad. Rajiv Gandhi's successor, Narasimha Rao, devalued the rupee and introduced radical reform policies. Since 1991 the government relaxed more and more its control on the Indian economy but the process was criticised by the IMF as very slow. Foreign investors welcomed the liberalisation process and increasingly invested in the country. In 1995, foreign direct investment stood at \$10 billion (Economist, 29 July, 1995). The liberalisation programme stopped short of creating a market economy. For example, the labour law did not change. During the years after 1991, the Indian economy grew at a faster pace than before, with the highest being 7% in 1995-96. There is also some evidence provided by the government suggesting that poverty fell in the years after the reforms from 25.5% in 1987 to 18.9% in 1993, but these figures are disputed by other Indian economists.



India has 22 stock exchanges. The two biggest by far are the Bombay Stock Exchange (BSE) which was established in 1885 and the National Stock Exchange (NSE). Although the state is the larger part of the economy, there are more than 6,000 companies (not all actively traded) listed in India's stock markets. Until recently, the microstructure of India's stock markets was rather obsolete: the share settlement system was paper based and computers were not introduced in the stock markets function. Also, the BSE has a history of not enforcing its rules and allowing market manipulation. After a big financial scandal in 1992, the authorities decided to promote a competitor to the BSE, the NSE. Competition between the two exchanges has resulted in the modernisation of both. In September 1992, the government allowed foreign institutional investors to buy Indian shares. Investors could buy up to 5% of any company's shares and all foreign portfolio investors could not hold more than 24% of any company. Some of the restrictions were further relaxed later on. Despite the restrictions foreign investors poured money into the stock market: the market capitalisation grew from 1,110 billion rupees in 1990 to 3,980 billion rupees in 1993. However, it is not clear how this money was invested. In 1992, Indian companies were putting 3% of their funds into stocks and bonds and 52% into fixed assets; in 1993 they put 22% into the markets and only 47% into fixed assets. Also, much of the capital raised was used for restructuring of finance; they exchange expensive bank credit for equity.

Most Indian banks were nationalised in two waves, in 1969 and 1979-80 by Indira Gandhi. The restrictions imposed on them made them unprofitable. Until 1992 they had to hold 38.5% of their net liabilities in government securities at very low yields. In 1992, this figure was changed to 30%. They also had to lent money to borrowers whom the government considered worthy, again at very low rates. The banks' staff were public employees who could not be fired and their union was one of the stronger in the country. In 1992, state owned banks employed 900,000 workers whose average pay was four times the usual pay of other workers. The union had the power to dictate the banks' operations. It refused to let the use of computers in more than one branch of every bank. In 1993, the union agreed to the introduction of computers at the rate of 1% per year for banks with fewer than 500 branches and 0.5% per year for banks with more than 500 branches. The profitability of the banks was eroded; in 1990 their profits were 1% of



capital employed. In contrast, foreign banks which were allowed to operate in the country were doing a lot better because the above rules did not apply to them. Since 1991, the banking sector has been included in the liberalisation agenda and changes have been made. The government bailed out problematic banks with re-capitalisation bonds; fresh capital for the banks while the government assumes their bad loans. The total bad loans of all 27 state banks in 1997 was 396 billion rupees, or 17% of their loan books. Since the reform started, the banks followed stricter accounting rules, have strong balance sheets and most have reported profits. The state banks could also issue shares and the foreign stock offering by the State Bank of India in 1997 was a big success. Many foreign financial institutions, such as Merrill Lynch and Goldman Sachs, have pursue partnerships with Indian financial firms because the financial market in India is undeveloped and it has a great potential. Foreign banks have also helped Indian firms to raise capital abroad in the form of Global Depository Receipts. Since 1992, more than \$5 billion were raised by Indian firms this way.

### **2.3.3. Mexico**

In 1928, the National Revolutionary Party - which today is named the Institutional Revolutionary Party - was established and has been in power ever since. It is the world's longest governing political party. Some of the party's economic policies was protectionism and import substitution. Mexico's growth rates for the last thirty years were low when compared to other developing countries. In the 15 years to 1981, Mexico's GDP grew by an average of 6.7% a year. From 1970 to 1982, Mexico's presidents - Luis Echeverria and Jose Lopez Portillio - followed expansionary policies which led to high inflation and deterioration of the balance of payments. Although government revenue grew in 1978 because of a high oil price, public spending grew even more. From 32% of GDP in 1978, public spending was raised to 48% of GDP in 1982. To cope with the increased spending, Mexico had to borrow from abroad. In the three years from 1979 to 1982, Mexico debt increased from \$50 billion to \$90 billion, which was about 60% of GDP or 335% of annual exports. In the three years to 1981, the economy grew fast but inflation rose to 100%. The peso was fixed against the dollar so it became overvalued. To lower inflation, the government responded with controls in prices and imports. In 1981-82, the price of oil fell and the US, which was the main market for Mexican exports, went

into a recession (US short term interest rates jumped from 9% in 1978 to 17% in 1982). Mexican revenues fell and the dollar denominated national debt became more expensive. Foreign reserves dried up and the government imposed stiff import controls. Imports fell by 40% after the quota were imposed and economic growth stopped. In August 1982 Mexico declared a moratorium on its debt repayment.

Since then Mexico has been praised by world economists but its economic recovery has not been stable. After 1982, the Mexican government tightened fiscal and monetary policy, devalued the peso and implemented liberalisation policies suggested by the IMF. In 1984, the public sector borrowing requirement (PSBR) was 8% of GDP, down from 17% in 1982. As the economy was recovering, in 1985 an earthquake flattened Mexico City and in 1986 the oil price collapsed. The PSBR widened and the current account went back into deficit. In the two years to mid-1987, the peso was devalued by 45% giving a boost to exports but sending inflation to 160% in December 1987. One of the measures took by the government to combat inflation, was to freeze wages and salaries through the Economic Solidarity Pact of December 1987. This was an agreement with trade unions and businessmen to freeze wages and prices. By December 1988 inflation was down to 50%. The government continued its tight fiscal policy. In 1989, the budget deficit was 5.8% of GDP, down from 16% in 1986. The peso was devalued again in 1988 by 20%. Between 1982 and 1988, GDP declined by an average 2% per year. Since 1988 the country experienced some economic growth but not as high as it hoped for (for the period 1988 to 1993 the economy grew by an average of 3.5% per year). In 1993, the government push up interest rates and the economy went into recession. By 1994, inflation was very low (below 8%) and the budget was in surplus. However, interest rates were very high and small and medium companies which could not find finance outside Mexico had to pay real interest rates of 15-20%, driving thousands of them bankrupt.

Mexico's exchange rate policy was to fix the peso against the dollar and at times it devalued the peso at a constant daily rate (e.g. in 1989 the peso was devalued at an annual rate of 14%). That rate of devaluation was much lower than the rate of inflation and although it reduced inflationary expectations it resulted in an overvalued peso. At times when the peso looked very expensive residents sent their capital abroad forcing the

government to raise interest rates in order to keep foreign exchange into the country (in 1989 the real interest rate was 35%). Eventually the government was forced to devalue the peso in December 1994, in the wake of a major crisis which spread in other Latin American countries (the 'tequila' effect). The 1994 crisis was devastating for Mexico. GDP fell by almost 7% in 1995. The country did not have enough foreign reserves to service its debt. Eventually, it was bailed out by a US \$40 billion rescue plan. After the devaluation, exports rose sharply and by 1996 the country showed strong signs of recovery. The peso was allowed to float freely against the dollar so that a devaluation would not have to happen again.

Since 1982 the Mexican government implemented reform policies. The first step for Mexico was to join the GATT in 1986 and liberalise its trade. This forced Mexican companies to compete with foreign companies. Between 1982 and 1994 the Mexican economy was completely transformed. The protectionist, state-led country became an open country with market oriented policies. Import quotas were abolished and tariffs were lowered from an average of 45% in 1982 (and ranging up to 200%), to an average of 11% in 1987 (and ranging up to 20%). In 1982, 95% of imports needed licences and in 1987 only 6% of imports needed licences. Personal income tax was cut from 50% to 35% and corporate tax from 56% to 35%. Tax loopholes were closed. President Salinas set up an anti-regulation agency, whose job was to scrap regulation which made opening and operating a business difficult. The Salinas government also liberalised foreign investment so that every investment of less than \$100 million was automatically approved, unless it was in industries of strong national interest such as banking and oil. The central bank was given independence. The agricultural sector was also reformed. Until then, land in Mexico was given to farmers through the ejidos; collective farms where the farmers did not own the land. This system made sure that all farmers had land. The problem with the system was that farmers did not have any incentive to invest in the land since they were not assured of its use. Throughout the 80's investment in agriculture was less than 2% of output. Under the reform system, farmers would have ownership of their land and they could seek joint ventures with foreign investors.



In 1994, Mexico joined the North America Free Trade Area. Another part of the reforms was the privatisation programme. The government tried to limit its involvement in the market by selling or closing down state owned companies. From the 1,155 parastatals in 1982, 230 were privatised raising \$3 billion and hundreds of others were closed by 1990. Between June 1991 and July 1992, the 18 state national commercial banks were privatised yielding \$12.4 billion. Most of the privatisation proceeds were used to pay the country's debt.

Banks were nationalised in 1982 for \$600 million by President Jose Lopez Portillio. About ten years later the government decided to privatise them again. The main reason banks were nationalised was because after the 1982 crisis most banks were technically bankrupt. Throughout the 80's companies and consumers had very little access to finance because most banks were unable to lend any money. Most of the credit during that period was provided by the government. At the end of 1991, M4 as a percentage of GDP was about 46% when in other countries it was more than 100%. At that time there was only one branch per 18,000 people compared with one for every 2,000 in Western Europe. Consumer loans in Mexico represented about 5% of GDP compared with about 50% in Canada. Investors realised that the banking sector in Mexico had enormous potential and paid more than three times book value to buy into the banks during the privatisation programme. After the privatisation in 1992, bank loans grew by 25%. Banks were allowed to compete with each other since interest rates were liberalised in two stages in 1988 and 1989. More than half the banks were bought by securities firms and formed financial groups. After liberalisation, it seemed that banks were still taking the same risks that nearly made them bankrupt in 1982. A lot of the banks were borrowing dollars and lending pesos, taking advantage of the stable exchange rate and the big difference between Mexican and US inflation. In order to avoid another crisis the central bank limited banks' foreign exchange liabilities to 10% of their total borrowings. Several of the banks had a large percentage of bad loans in their portfolios. Overdue loans in 1992, accounted for 4.7% of total loans while some banks had up to 14% of their loans not paying interest. About 9% of credit card loans were overdue. The problems escalated in 1995, following the December 1994 peso devaluation. Several banks avoided bankruptcy thanks to government schemes which bailed them out. These schemes included the sale of

one tenth of all debts to the government, real interest rate caps and the lengthening of some debts' maturities. The government created an agency to restructure and sell many of the banks' assets which it held, trying to create a secondary market for bank loans. In 1996, bad loans accounted for more than 30% of banks' total loans. Banks were not allowed to consolidate and foreign firms could not have more than 1.5% of the market in 1992. By 1996, about 14% of Mexico's banking industry belonged to foreigners.

The Mexican stock market is very volatile compared to other emerging stock markets. After the 1982 crisis, the Mexican Bolsa was one of the most profitable in the world. Between 1982 and 1987 the market rose 16-fold. In 1982 there were 66,000 accounts with stock brokers and in 1987 the figure was 312,000. The equity market was dominated by five big companies (Telemex, the communications monopoly, Televisa, the broadcasting giant, Cemex, the cement producer, ICA, the construction and engineering company and Vitro, the flat glass produce). Foreign participation in the Bolsa was relatively small (22% of market capitalisation in 1992) but accounted for 60% of the market's turnover. Between 1982 and 1997 the market had two major crashes, one in 1987 before the peso devaluation and one in 1994 when the peso was devalued. However, for the rest of the period the index was still very volatile and the index experienced mini crashes (e.g. in September 1992 it lost one third of its value because of fears that Mexico would not join NAFTA and in April 1994, mainly because of political uncertainty). A lot of Mexican stock is traded in New York and in total, 41 stocks were traded in foreign markets in 1993. Because many Mexican blue chip are traded in the New York stock exchange which opens one hour earlier, prices in the Mexican Bolsa usually follow New York. In 1993 legislation was approved to allow foreign stocks to trade in Mexico.

#### **2.3.4. South Korea**

The economic "miracle" of South Korea has for many years baffled the advocates of free market. From 1910 to 1945 Korea was under Japanese rule. When the war ended the country was split. Three quarters of South Korea's citizens were impoverished farmers. Since then the country has experienced spectacular economic growth. This growth was the result of the Korean model designed by Park Chung Hee who run the country from his coup in 1961, to 1979 when he was assassinated. Park directed investment towards the

development of heavy industry such as steel and shipbuilding. These industries were heavily subsidised. The focus then was on economic growth and nothing else. Wages were very low by international standards which made the South Korean products very competitive. The ingredients behind the spectacular South Korean economic growth were subsidised capital, imported technologies, low wages, promotion of exports and restriction of imports.

The promotion of these industries resulted in the creation of huge conglomerates, the chaebol. Unlike India, where government intervention resulted in inefficient and loss making industries, the chaebol were very successful. POSCO, for example, the steel manufacturer, became in a few years a very efficient steel maker and successfully competes with Nippon Steel, the world's largest steel manufacturer. The economic success of South Korea during the late 1970s and early 80's was very high by international standards: between 1953 and 1988, national income in real terms had expanded by 1,200%. While in 1970 there were refrigerators in 2% of households and telephones in 4% of them, in 1988 three quarters of households had refrigerators and half of them had telephones.

The government spent a lot of money on education: in 1960 27% of children were enrolled at school; in 1983 the same figure was 89%. There is also intense competition for university places since without a degree, a South Korean is expected to find a job only as a labourer. Another desirable effect of economic growth was the reduction in poverty: in 1965, 40.9% of households were in absolute poverty; in 1980, 9.8% of households were poor. The economic growth of the country had undesirable side-effects as well. The government did not concern itself with problems that could hamper the competitiveness of South Korean products by increasing their costs. So, the country was left with a big pollution problem, inadequate social welfare and no safety standards for workers.

For all their success the chaebol had a big problem: to expand rapidly they borrowed vast amounts both domestically (low rate loans) and abroad. In 1986, South Korea's debt was \$46 billion, the largest in Asia. The chaebol, assured of government protection, continued to borrow and expand their operations in every sector they could. Furthermore, the



chaebol distorted competition. A chaebol subsidiary could drive competition out of business because it enjoyed easy access to capital, political contacts, a ready-made customer base and the ability to sustain losses for a prolonged period since the parent company would always cover them. However, if business slowed down, the chaebol would be unable to service their huge debts. Because of their size, this would have a devastating effect on their associate companies and banking system and the whole economy could become unstable.

The administration of Chun Doo Hwan, which succeeded Park, tried to break up the chaebol and reduce their importance in the economy. They also tried to reduce government intervention and introduce liberalisation policies<sup>8</sup>. The government introduced legislation to stop chaebol member firms guaranteeing loans for another member, restrict cross-shareholdings, reduce indebtedness by issuing shares and limit their operations to two or three industries. The first major incident of a chaebol in trouble was in 1985, when Kukje, the sixth biggest chaebol, collapsed resulting in the write off or roll over of 900 billion won of loans. In 1997, a full blown economic crisis hit South Korea resulting in thousands of bankruptcies.

In December 1987, South Korea saw democracy and an elected president after many years of colonial rule and dictatorships. Democracy brought pressure on the government to increase the low wages and trade unions gained significant power. Between 1987 and 1992, average wages rose by more than 18% a year, while productivity rose by only 10% a year according to estimates of the Bank of Korea.

The banking sector of South Korea had been used to develop the heavy industry. The country's four commercial banks were nationalised under Park and privatised during the 1980s. Five more banks were allowed to open up. The government did not let the banks assess the riskiness of their borrowers because the development of the market was not based on market forces but the state's industrial plan. Although the country has several successful companies, several others failed leaving the banks full of bad debts, which in 1987 accounted for 10% of total commercial bank lending. In the 1980s the government

---

<sup>8</sup> For a review of the 1980s reforms in South Korea, see: Amsden and Euh (1993).

decided to interfere less in companies' investment decisions but it still promoted favoured sectors of industry and the banks had to finance them. In 1990, these "policy loans" accounted for 54% of total bank lending. In 1982, the government abolished preferential lending rates and set all bank lending rates at 10%. However, lending at preferential rates of interest continued after that. In December 1988, the government liberalised interest rates and in theory it would not interfere with banking operations any more, which did not happen. The Ministry of Finance suggested to banks both deposit and loan rates through "window guidance". This aimed to prevent interest rates from rising too high. This unsuccessful liberalisation attempt was followed by another on November 1st, 1993. Also, rules preventing competition among different types of financial institutions were relaxed. The liberalisation process continued in more recent years. On December 17th, 1996, the government announced that regulators would force unsound banks out of business. All the reform policies aimed to strengthen the banks position. The reason banks came into such trouble is not only because they had to lend to projects suggested by the government. The banks were also "encouraged" by the Ministry of Finance to act as a shock absorber for the stock market. When the stock market was overheated, banks were instructed to sell shares and when the market was bearish banks were instructed to buy shares. This practise resulted in large losses for banks: in 1996, analysts in Seoul estimated that shares owned by South Korean banks were worth \$5 billion less than the banks paid for them. Another source of losses for banks was the use of real estate as collateral from borrowing companies. When the real estate bubble burst in South Korea, banks faced large losses. Korea First Bank, a commercial bank, was in serious trouble and was bailed out by the government in September 1997, with an emergency loan of \$1.1 billion. In October 1997, the government had to provide another \$1.1 billion to 16 merchant banks<sup>9</sup> to avoid bankruptcy. Despite the problems, the government still urged banks to lend money to ailing firms.

The development of the stock market in South Korea was also a part of the government's development plan. The government did not want to let interest rates rise and saw the

---

<sup>9</sup> Merchant banks in South Korea are not like the merchant banks operating in the rest of the world. Their function is to provide short time loans to companies too frail to borrow from commercial banks or issue bonds.

stock market as a useful instrument to mobilise domestic savings. Another function of the stock market was to diffuse the wealth of the chaebol to the general public. To achieve that, the government forced the chaebol to raise capital from the stock market with a series of measures. It restricted them from borrowing from abroad and enforced debt-equity ceilings. The stock market was closed to foreign investors until January 1992. Until then, foreigners could buy into Korean companies through country funds and convertible bonds. A real-time computerised trading system existed only for a handful of the most traded shares and rules and regulation were not properly formed.

In May 1990, the government launched a four trillion won “stock market stabilisation fund”. The money came from securities companies, financial institutions and listed companies. The role of the stabilisation fund was to respond to excessive changes in the stock market: when the market was bullish the fund sold shares and when it was bearish it bought shares. The Korean stock market experienced a boom in the late 1980s and the stock market became very popular with investors and companies. The number of listed companies increased from 352 in 1980 to 686 in 1991 and in the same period the stock market capitalisation grew tenfold. In 1992, the market opened to foreigners but not completely. Foreign ownership of a company could not exceed 10%, with some exceptions. Foreigners were initially slow to enter the South Korean market but towards the end of 1992 inflows picked up. In the first quarter of 1993, \$1.2 billion entered the stock market from abroad and pushed prices up. By that time 27 foreign securities houses had representative offices in Seoul. In December 1994, the ceiling on foreign ownership rose to 12% and was later raised further with the intention to eventually abolish it. To further develop the financial market the government listed a stock-index futures contract in May 1996.

### **2.3.5. Taiwan**

The economic success of Taiwan is similar to that of South Korea. The country became from an agricultural economy an industrial one within three decades. Between 1950 and 1980 the number of factories in Taiwan increased from 5,623 to 62,474. Exports were promoted and imports were restricted with tariffs. The main difference between South Korea and Taiwan is that although both countries had restrictions on international trade



and capital, the Taiwanese government did not impose severe restrictions domestically. More specifically, prices were left on market forces and interest rates were not kept artificially low. The lack of cheap credit forced the companies to become equity-based and did not allow them to grow to the size of the South Korean chaebol. The market in its majority is composed by small and medium enterprises, of which there were about 700,000 registered in 1983. Apart from the monetary policy, fiscal policy was also tight: since the late 1960s the budget was always on surplus except for a few rare occasions. Also, Taiwan did not rely on foreign debt too much. Its foreign debt was always one of the lowest in East Asia and at the end of 1997 it was a negligible \$100 million. The country's growth came exclusively from exports. The country has presented a trade surplus almost every year for the last thirty years. This surplus resulted in the accumulation of huge foreign reserves; in 1997, these reserves amounted to \$82 billion.

The economic success of Taiwan has resulted in a dramatic increase of income for the 21 million Taiwanese. Annual income per person is about \$10,000 when forty years ago most Taiwanese lived in poverty. Unemployment has officially been around 1% for the last thirty years. Virtually all Taiwanese know how to write and read and some 45% of them get higher education. Life expectancy has increased by 15 years compared to 1950. All households have a television and there was one car for every ten people in 1990. There is no welfare system in the country. The old, the sick, student and unemployed are left in the care of their family. This is balanced by the very low income tax. Urbanisation has seen many young Taiwanese going to cities to get a job and an increased cost of living in the cities, mainly because of the soaring property prices. In 1997, the government was working on a national pension scheme.

A big part of the Taiwanese economy is black economy. The size of the black economy is estimated to be about 40% of the official one. Actual foreign investment made by Taiwanese is a matter of guesswork. In 1988, the Ministry of Economic Affairs said that it approved \$218 million of overseas investment, but Thailand alone said that for that year it accepted \$2.1 billion of foreign investment from Taiwan. The most developed part of the black economy is the financial market. Taiwan has an underground futures market, and off-exchange stock market, a black-market foreign exchange network and an

underground banking system. All these are so developed that are considered as part of the official market. Especially the black market lending industry is so well-established that the central bank publishes monthly statistics of the prevailing interest rates in that market.

The Taiwanese stock market was one of the most volatile in the world during the late 1980s and 1990s. The share price index went from 1,000 in 1986 to 12,500 in 1990 and turnover for that period was one of the highest in the world. In 1990 it fell to 2,500. For the rest of the period it followed an upward trend but with large fluctuations. The Taiwanese became rich because of the country's economic success but did not have many investment outlets. They were not allowed to invest abroad and for those who did not want to do physical investment there were two main options: the stock market and the real estate market. During the late 1980s both markets overheated because of increasing demand and speculation and during the 1990s both markets collapsed. The Taiwanese stock market was rather small in size (only 130 companies listed) and closed to foreigners during the boom. The only way foreigners could buy into the stock market was through funds traded abroad: the Taiwan ROC, Formosa and Taipei funds listed in London and the Taiwan fund listed in New York. Because of the scarcity of Taiwanese stock these funds traded at prices much higher than their original price. However, the stock market did not probably represent the Taiwanese economy. The success of the economy was due to the thousand small and medium firms which are not listed on the stock market. Furthermore, 25% of the index's composition was made up by the banking sector which was government controlled and rarely traded. The Taiwanese stock market acquired the reputation of a casino. The government took some steps towards developing the stock market with a series of reforms in 1988: tighter regulation, introduction of a tax on capital tax gains to slow down the boom, the end of a 15-year old ban on new securities firms and the allowance of foreigners to invest in local broking firms. Due to these measures the number of brokerages went from 28 to 320 within four years. The boom ended in 1990 when the central bank increased interest rates in an attempt to reduce money growth and restrain inflation. In 1991, foreign investors were allowed to buy Taiwanese shares but only limited; foreigners could buy only 4.9% of the local market. Since then the limit on foreign money entering the stock market was raised gradually.



The banking sector in Taiwan is also not very well developed compared to other countries. All banks were state-run. Foreign banks in Taiwan were not very active because of the government's unwillingness to liberalise this sector. Most foreign banks operating in the country were limited to just one branch. Most of the lending to companies was done through the massive illegal market in financial services. This comprised some 200 investment companies which were illegal deposit takers which offered high interest rates. In most years, Taiwan saved more than it invested. Until 1987 it was a criminal offence to bounce a cheque. Collateral, almost double the face value of the loan, was almost always demanded in order to provide a loan. Foreign banks could not operate efficiently, too, because the government restrained them by regulating their lending, deposit-taking and reserves. The sector's supervision was inadequate and in 1995, it was revised by the government. In the late 1980s, the government decided to slowly liberalise the banking sector. In 1988, it allowed all Taiwanese banks to set up branches overseas to locations of their preference. To create competition, the government allowed in 1989 private banks to enter the market. In 1990, it started selling its share of the three biggest commercial banks. At the same time, it relaxed the restrictions on foreign banks operations and allowed more foreign banks to enter the market. By 1992, there were 16 privately owned commercial banks and 15 more were authorised. In addition to that, there were 37 foreign banks in the country and another 22 had representative offices. The liberalisation process continued for the rest of the sample period. More state banks were privatised (partially), foreign banks gained more freedom to expand their operations and the sector became more strictly regulated.

## **2.4. Summary and Conclusions**

In this chapter we provided a brief overview of foreign investment in several emerging economies as well as a profile of the five countries included in our first test. The overview at the beginning of the chapter also serves to indicate the importance of examining issues surrounding the development of emerging stock markets.

Flows in these markets increased dramatically during the last 20 years. Market capitalisation in both regions increased by more than ten times since the late 1980s. This

trend suggests that stock markets in these economies are becoming more and more important, not only for these countries but as a part of the world market.

The profiles of the five countries should help us understand better some of the issues involved in emerging financial markets and put the results presented later into perspective. All countries moved towards a more liberal economy but each country followed a specific path towards liberalisation and liberalised its economy to a different degree. Our sample should provide an interesting case study because we can link the economic policies adopted by each country to our results and evaluate the effectiveness of these economic policies. The selected countries offer a wide range of economic regimes, from the very liberal Chilean and Mexican economies to the rather restrictive Indian economy. Bearing in mind the characteristics of each economy, we now move to discuss the economic theories on stock market liberalisation.



## **CHAPTER 3: THEORETICAL BACKGROUND**

### **3.1. Introduction**

Before moving on to consider the perspectives on financial liberalisation, it is useful to attempt a simple schematic outline of the approaches. This will of necessity be broad and sometimes imprecise but is intended to simply provide some context to the discussion. The arguments for and against the financial liberalisation thesis are provided by the neo-classical and the Keynesian schools of thought and reflect their somewhat different views of the economy. The neo-classical economists believe that the economy is supply-driven and demand simply follows. Neo-classical economists accept Say's law (that supply creates its own demand) so supply and demand always coincide.

Central in the neo-classical theory is the assumption of price flexibility which is used to ensure equilibrium. Moreover, nominal wages are flexible downwards and they can move the economy from a position of involuntary unemployment to a position of full employment. Another feature of the neo-classical theory is that the interest rate is determined by savings and investment. Savings precede investment and are determined by the interest rate. Money supply is largely considered exogenous in the neo-classical theory. An important feature of this approach towards financial institutions, is that they are considered simply as intermediaries between savers and lenders. Banks are restrained in their lending by reserve requirements. Both the monetary system and the liquidity system (financial institutions), do not give any feedback in the economy when interest rates or prices change. In this sense, their role is a passive one.

One of the most important features of the neo-classical theory is the significance of market forces. Neo-classical economists believe that the economy adjusts at the position of full employment on its own, if it is left to operate alone. The basic assumptions behind the market forces is that individuals maximise their utility and firms maximise their profits.

The simple neo-classical models were criticised by Keynes (1936) who argued that the economy does not have to reach the level of full employment. Instead there can be an equilibrium at a lower level. The economy according to Keynes is demand driven and current demand is based on expectations of future demand. Investment does not depend heavily on the interest rate since most investment is carried out by the companies' retained earnings. The latter are based on the mark up companies put on their products which is determined by the need for future investment and the availability of external finance. Keynes argued that the economy does not have a natural tendency to reach equilibrium because of rigidities in prices and wages. Because prices and wages do not move downwards in the Keynesian framework, Say's law cannot work<sup>1</sup>.

The Keynesian criticisms led to the neo-classical synthesis [Hicks (1937), Samuelson (1948)] which borrowed elements from the two schools of thought. The neo-classical synthesis assumes that Say's law holds and ensures full employment in an economy. However, the natural tendency of an economy to return to the level of full employment may be hampered by the Keynesian assumptions which the synthesis accepts. Downward price and wage rigidity may keep the economy away from full employment in the short run. Other assumptions of the neo-classical synthesis are a liquidity trap and the inelasticity of investment with respect to the interest rate.

Because of the assumptions of the synthesis, the economy may be below full employment for a considerable amount of time. It is therefore, necessary for the government to intervene in order to restore full employment. Economic policy in this framework depends on the estimation of multipliers which show the effect of changes of exogenous variables (taxes, government expenditure) on the economy. The problem with this method is that the multipliers are estimated to account for the effect of a particular policy on the economy. However, their estimation depends on historical data which refer to periods when this particular policy was not necessarily pursued. Therefore, the multipliers will give the wrong signals. Also, this approach does not accommodate the

---

<sup>1</sup> For a discussion on the differences between neo-classical and Keynesian models, see: Levacic and Rebmann (1982).



reaction of economic agents. The problems of this approach are discussed by Lucas (1976).

The Keynesian criticism of the neo-classical model and the neo-classical synthesis, has led a group of economists to form what is known as the post-Keynesian school of thought [Arestis (1988, 1992), Arestis and Skouras (1985), Palley (1996)]. Post-Keynesian economics is an updated and extended version of Keynes' theory. So, as in Keynesian economics, post-Keynesians believe that output depends on demand and that the most important factor affecting output today is expectations for future demand. So, agents form their expectations for the future and invest accordingly<sup>2</sup>. Post-Keynesian investment theory differs from Keynes investment theory in that not only expected profitability matters but realised investment matters as well because it creates profits which can be reinvested<sup>3,4</sup>.

The level of demand depends on investment as well as on consumption spending, which is a function of employment. Post-Keynesians do not accept Say's law, not only because of price and wages being downward rigid, the liquidity trap and the interest inelasticity of investment but also because demand may simply not be enough to cover supply, because of pessimistic expectations for the future.

Clearly there are two basic theoretical directions provided by the schools of thought outlined above: a *laissez-faire* and an interventionist one. The neo-classical theory and the neo-classical synthesis both favour a liberal economy where market forces are allowed to operate freely. The post-Keynesians argue that government intervention is essential because there is no mechanism which ensures full employment. Instead, the economy may possibly experience crises which can be avoided (or become milder) if the economic authorities intervene. Obviously, the differences in these directions have

---

<sup>2</sup> In the post-Keynesian theory as in the Keynesian theory, investment is determined by 'animal spirits'.

<sup>3</sup> See: Kalecki, 1971. Retained profits explain why interest rates are of secondary importance to investment. Retained profits are internal funds which companies can use irrespective of the interest rate. The latter only matters when companies wish to raise additional finance.

<sup>4</sup> Another factor affecting investment is technological change, which contrary to neo-classical economics is endogenous.

implications for the theoretical developments on financial markets in emerging economies.

### **3.2. The financial markets development in emerging economies**

Until recently, most developing countries had adopted protectionist policies. They believed that openness to foreign investment from the developed countries would result in exploitation of their natural resources and not in domestic development. So, several of these countries tried to completely insulate their economies from any external influence believing that they could achieve some degree of self efficiency. They also tried to manipulate their domestic economies by means of low interest rates, minimum wages, etc. This was the reason behind interventionist policies such as the import substitution policies implemented by India and Mexico<sup>5</sup>. After the debt crisis of the 1980's, several developing countries had to change their ways because they had failed to achieve the growth levels of developed countries and were still depending on them for finance. The theoretical justification for financial liberalisation was provided by Shaw (1973) and McKinnon (1973). Both these economists argued that the problem with developing countries was their governments' interference with the economy. Their approach is a neo-classical one, where financial markets can promote economic growth if they are deregulated.

The next section gives a brief description of the main features of financial repression. Following that is the neo-classical propositions for financial liberalisation and a critique of these propositions from a post-Keynesian perspective.

#### **3.2.1. The financial repression paradigm**

The main feature of financial repression is low nominal interest rates [Fry (1997) p.76]. These are believed to assist economic growth through increased investment. Capital, under these conditions, is cheap and there is always excess demand for investment. Real interest rates are sometimes zero or negative since they do not cover the rather high inflation rates usually found in developing countries. High inflation is created by a

---

<sup>5</sup> For a discussion on the reasons for and effectiveness of import substitution policies, see Bruton (1998).



growth in nominal money that exceeds growth in real money balances demanded [Roubini and Sala-I-Martin (1992)]. The result of low interest rates is low savings which are not enough to cover the demand for investment. Therefore, credit is rationed (which has implications for the efficiency of the resource allocation, as we shall discuss in the next section), and curb markets for credit are created, where interest rates are extremely high, for finance which is predominantly short term. Another part of financial repression is cheap foreign exchange. The price of foreign exchange is kept artificially low and imports are relatively cheap. This allows entrepreneurs to buy capital equipment from abroad cheaply. Consumption goods imports are usually restricted or the import quotas are so high that these products are too expensive for the people of the developing economy.

Because capital is very cheap, the growing industry of the financially repressed economy is capital intensive[see: Shaw (1973) p.13]. The result is high unemployment and only a small percentage of the population is qualified to work for the capital intensive industry. In order to fund its social security system and its development programme, the government can rely on few sources of finance. The largest part of that finance comes from the country's few exports and import quotas. Since revenues are usually not enough to cover expenditure, governments have to rely on inflation to finance their deficits [Fry (1997) p.31]. To cover the high demand for capital, governments borrow from abroad, most times at high interest rates, and then ration the money themselves.

These are some of the aspects of financial repression. Although these are its main features, policies vary from country to country. Financial repression aims to manipulate the economy. To this end, all prices in the economy are distorted to serve the government's plan. Another aim of this policy is to isolate the country and make it independent of foreigners. This is usually the result of popular sentiment after colonialism (e.g. India). Although financial repression was very popular among developing countries until the 1980s, there are not many success stories. The best known success story (until recently) was South Korea. After the debt crisis, it became obvious that financial repression had failed to contribute to the economic development of these countries. One alternative was provided by the financial liberalisation thesis.

### **3.2.2. The financial liberalisation thesis**

The financial liberalisation theory was first developed by McKinnon(1973) and Shaw (1973). Its basic argument is that interest rate liberalisation will increase savings and investment and result in faster economic growth and that increased real interest rates will only allow the most productive projects to go through, increasing thus the efficiency of investment. The whole process aims to develop the capital markets of the developing countries to achieve what Shaw (1973) calls financial deepening. This is based predominantly on neo-classical assumptions about interest rates, financial markets functioning and the economy in general (e.g. one of the basic assumptions of the thesis is that only real money are important and there is no money illusion). The advocates of this thesis<sup>6</sup> argue that if interest rates are liberalised in developing countries, then they will rise and real interest rates will rise too. The higher interest rates will attract more savings because of the higher return. These savings will be channelled in the economy in the form of investment. The real growth of the financial institutions provides potential lenders with a bigger and more efficient market for credit. The assumptions made about the financial institutions is a typical neo-classical one: their role is to intermediate between borrowers and lenders. Furthermore, it is assumed that financial services become cheaper and more efficient as capital markets develop. Financial firms compete with each other driving the cost of intermediation down and, in trying to identify the best investment opportunities, they generate information and provide access to finance only to the 'best' investments.

Another effect of financial liberalisation is the reversal of capital flight. Since savers have access to interest rates as high as in other economies, they have no incentive to send their money abroad. This serves to further increase savings in the developing country and promote investment. The developing country will have no reason to prohibit capital flows and the foreign exchange rate will stabilise at a level reflecting the country's economic condition. At that point, access to foreign capital markets should become easier. This effect together with the increase of savings serves to fill the dual gap in developing countries: the gap between savings and investment and the gap between investment and foreign exchange (if most of the planned investment is based on capital imports).

---

<sup>6</sup>McKinnon and Shaw were hugely influential and several academics and policy makers supported their theories; for example, see Drake (1980).



The financial liberalisation thesis claims that unemployment should fall following reform policies. Following the neo-classical assumptions about market forces, advocates of the thesis argue that unemployment in developing countries is high because of financial repression. The very low interest rates combined with high minimum wages, make investors choose capital intensive production, even though labour is the one thing developing countries have in abundance. If market forces are allowed to operate, capital intensive productions will become too expensive for the developing countries relative to labour intensive productions. The wage will fall and the demand for labour should increase (especially since the exchange rate will fall making domestic products competitive abroad and thus, increasing output).

### **3.2.3. Post-Keynesian criticism of the financial liberalisation thesis**

Post-Keynesian economics agree with part of the above theory: that the development of financial intermediation in an economy can and should help economic growth. However, it is clear from the above that the financial liberalisation thesis is a supply-led theory; it assumes that the supply of finance will be used to stimulate investment. Post-Keynesian economists believe that the economy of any country is demand-led and the development of the financial sector will follow the increasing demand for financial instruments, as the economy grows.

A problem of the liberalisation thesis may be that interest rates do not affect the *level* of savings but the way they are held [Dow and Earl (1982)]. As interest rates rise, savers will be induced to switch from holding cash to financial assets and may even be tempted to increase savings, but the main effect of such a policy will not increase savings dramatically<sup>7</sup>. According to the post-Keynesian theory, savings can only increase if income increases, so people will spend a smaller proportion of their income. However, income increases when investment increases, therefore, the only way to increase savings is to stimulate the demand side of the economy.

---

<sup>7</sup> In fact, under certain circumstances, higher interest rates may result in lower savings. For a discussion, see: Akyuz, 1992.

Even if savings increased, there is no guarantee that it would be used for investment purposes. Contrary to neo-classical theory, post-Keynesians argue that investment depends on the rate of return on capital and it does not have to reach an equilibrium with savings. In developing countries, real returns on capital are lower than in developed countries. Khatkhate (1980) argues that this is the reason behind the low incomes observed in these countries. In order to increase investment, interest rates would have to rise but not above the rate of return on capital. This would not be a problem, if the capital account of these countries was closed (and the authorities had the means of effectively policing capital flows). Because rates of return on capital are always higher in developed countries, capital would naturally flow to developed markets, leaving the developing ones with a financial capital shortage. Therefore, letting interest rates rise, will not be an effective way of increasing investment in these countries. In this respect, it is the openness proposed by the liberalisation thesis which makes it difficult for developing countries to stimulate investment<sup>8</sup>.

### **3.3. Issues examined**

Obviously, the liberalisation reforms followed by developing countries, created a large number of issues needed to be examined by economists. Especially since most countries followed a unique path to liberalising their economies and pushed the reforms to different degrees, there is clearly a need for a lot of research to be carried out in the area in order to identify not only the impact of financial liberalisation on these economies, but also to compare different reform paths and identify the strengths and weaknesses of each one<sup>9</sup>. Clearly, this is a huge task which will require a considerable amount of research. Since the theoretical arguments point to two different directions, the analysis of these issues will have to be an empirical one. In this thesis, we examine three issues concerning the development of stock markets in developing countries. These are the impact of the stock market development on economic development, the change in stock market volatility after foreign investors were allowed to enter these markets and the change in the degree

---

<sup>8</sup> At this point, it should be noted that the capital flow restrictions which are in place in several developing countries do not work anyway. Capitalists usually find a way of exporting capital illegally.

<sup>9</sup> Horne (1995) provides a discussion on several issues surrounding the economies of transition.



of integration (or segmentation) of national emerging stock markets, following liberalisation.

### **3.3.1. Stock market expansion and economic development in emerging economies**

The development of stock markets in emerging economies is a rather recent phenomenon. It started in the early 1980s mainly because of the third world debt crisis. The World Development Report for 1989 suggested that government-directed credit - which was often subsidised - to priority industries in these economies failed to assist economic growth, and as a result, the World Institute of Development Economics Research (WIDER) Study Group proposed the development of equity markets in these countries as a way to attract foreign capital. It also proposed the abandonment of the IMF article which allowed member countries to exercise controls in international capital movements and promoted the development of stock markets as an alternative to debt finance. It argued that the establishment of an equity market is of vital importance for economic development in every country.

The theoretical discussion on capital market development in developing countries begins with the work of Shaw (1973) and McKinnon (1973). Keynesian economists challenge the validity of the neo-classical propositions both at a theoretical and an empirical level [Akyuz (1991)]. The main points of their criticism are based on the relationship between savings and investment and the savings behaviour of individuals. They argue that the assumption that higher interest rates will lead into higher corporate investment through higher savings of the personal sector, will depend on the savings propensity of the parties involved [Akyuz (1992)]. Higher interest rates could reduce corporate profits so, if the savings propensity of individuals is lower than that of the corporations, total savings will fall (Akyuz's discussion of the Turkish financial liberalisation experience shows that higher interest rates can have a random impact on total savings).

Furthermore, Hoffman and Stiglitz (1991) argue that even if credit markets were perfect, they could still not allocate credit efficiently because of asymmetric information. Interest rates function as a pricing mechanism as well as an instrument indicating the riskiness of the borrower. If there is excess demand for credit, financial institutions will ration credit

rather than increase interest rates, since the riskier rather than the most efficient borrowers will accept these higher interest rates. Stiglitz (1994) advocates government intervention since financial markets are prone to failures mainly because of information imperfections. Fry (1997), however, argues that information imperfections can be addressed within a liberalised financial environment. Moreover, financial repression does not guarantee improvement of capital allocation efficiency. The main problem with Stiglitz's propositions is that they rely on an exemplary government, which is rarely the case. An example of successful government intervention has been the Korean economic miracle<sup>10</sup> but, as Fry argues, "there are extremely few other developing countries for which the same claim could be upheld"<sup>11</sup> (p. 761).

#### **3.3.1.1. The role of the stock market in an economy**

Some economic researchers cast doubt on the usefulness of a stock exchange - even a well developed one - compared to a bank oriented system in enhancing economic growth. There is evidence which suggests that the stock market has not contributed in the financing of physical investment in the UK and the US during the last two decades. For example, Mayer (1988) finds that during the 1970s and 1980s, the stock market made a negative contribution to investment in the UK and US, and surprisingly, a small positive contribution in Germany and Japan where the role of the stock market is rather limited. In terms of economic growth and international competitiveness, Germany and Japan have been more successful than the US and the UK. It is argued that the Anglo-Saxon countries are at a disadvantage mainly because of short termism in investment opportunities [e.g. Financial Times, 24 April 1990; MIT (1989)]. This short term attitude towards investment is closely related with the active role of the stock market in these economies.

---

<sup>10</sup> For a discussion of the process which led to the economic success of South Korea in the 1980s see Amsden and Euh (1992).

<sup>11</sup> The best example is the financial liberalisation in Latin American economies which proved disastrous mainly because of inadequate or inappropriate government regulation. Especially with respect to the banking sector, government regulation resulted in the destabilisation of the banking system like the bank run in Argentina, when on 28 March 1980 the Banco de Intercambio Regional closed for liquidation. For a discussion of the liberalisation programmes implemented in Argentina, Chile and Uruguay during the late 1970s and early 1980s, see Corbo and De Melo (1985), and Diaz-Alejandro (1985).



In Germany and Japan the financial system is bank based. Banks in these countries have a long term relationship with their clients and often there is cross ownership between financial institutions and industrial corporations. In this environment managers are not concerned with short term stock price fluctuations, but are focused on the long term instead. Because of the close relationship between banks and corporations, the latter often have a low cost of capital and can accept a low rate of return (in the case of Japan, government intervention, too, has contributed in the low cost of capital). The MIT Commission Report gives examples of markets where Japanese companies went in and accepted low rates of return, which has contributed in the development of the real economy and international competitiveness of Japan. Such investment opportunities cannot be accepted in the Anglo-Saxon economies since the stock market would punish a low rate of return.

These observations which are often cited in the economic growth literature, echo Keynes thoughts "...the spectacle of modern investment markets has sometimes moved me towards the conclusion that to make the purchase of an investment permanent and indissoluble, like marriage, except by reason of death or other grave cause, might be a useful remedy for our contemporary evils. For this would force the investor to direct his mind to the long-term prospects and to those only" [Keynes (1936) p.160].

With respect to corporate growth, the role of the stock market has been a controversial issue for many years. The neo-classical view until recently was dominated by the "irrelevance theorems" developed by Modigliani and Miller (1958). These theorems argue that the capital structure of the corporation is not related to its economic performance. The latter depends only on expectations about future earnings and that would be the only basis for the corporation's share valuation. However, this view was generally rejected because when the complexities of the real world are considered it does not hold. Such complexities involve taxation issues, asymmetric information between managers and shareholders, moral hazard, agency costs and transaction costs [Edwards (1988); Mayer (1988)]. The Keynesian approach assumes imperfect capital markets in relation to transaction costs and the availability of relevant information to all participants. In the Keynesian view, the firm's capital structure, its dividend pay-out decisions and its

retained earnings are important variables in determining the firm's share price and its investment opportunities.<sup>12</sup>

### **3.3.1.2. Equity markets versus banks**

Theory supports that financial intermediation can enhance economic growth. The question arises as to what kind of financial intermediation is appropriate for developing countries; i.e. equity markets or a banking oriented system. Most developing economies have traditionally been bank oriented. So, why should they encourage the development of stock markets?

The stock market can enhance economic growth in three ways: growth of savings, efficient allocation of resources and better utilisation of the existing resources. These, however, are broadly the same functions performed by the banking sector when interest rates are free to reach their equilibrium level, as proposed by Shaw and McKinnon [however, as shown by Clarke (1996), an equilibrium interest rate may not exist since the interest rate required to balance financial markets differs from that required to equilibrate savings and investment]. The stock market can perform the above tasks by acting as a pricing instrument and with the takeover mechanism<sup>13</sup>. The latter and the fact that stock market provides investors with liquidity<sup>14</sup> are the main features which make a stock market desirable compared to a banking system. As for the role of the stock market in increasing efficiency in resource allocation by acting as a pricing mechanism, Singh (1992) argues that share prices in these countries are too volatile to be used as information about firms' prospects.

The establishment of an active stock market may also be desirable because of the weaknesses of the banking system. Banking finance has always been problematic because long term illiquid investments rely on short term deposits. In the case of developing

---

<sup>12</sup> For a brief discussion on the development of corporate finance theory and suggested literature see: Demirguc-Kunt, 1992.

<sup>13</sup> For a discussion on the takeover mechanism, problems associated with it and a summary of the existing literature on the subject, see: Hughes and Singh, (1987).

<sup>14</sup> For a discussion on the importance of liquidity of investments, see: Hicks (1969) and Keynes (1936). Also, Bencivenga, Smith and Starr (1996) present a model showing how liquidity can affect savings and income and Bhide (1993) provides a good discussion on the problems that stock market liquidity generates for corporations.



countries where the economic environment is very volatile, this problem is even bigger and banks could be forced to liquidate some of their investments (recall their loans) or ration credit if faced with liquidity problems. Financial shocks - which are common in developing countries - can change the availability and the cost of finance. In the case of an increase in interest rates, the cost is passed on to companies with variable rate loans. This was especially the case in Latin American countries after the 1982 debt crisis. Furthermore, banks may have very few or no incentives to exercise control over the firms to which they lend capital [Stiglitz, (1985)]. If the entire loan is covered by collateral and the bank is not otherwise related to the firm (e.g. own equity of the firm), then it could be costly to the bank to exercise any control.

### **3.3.1.3. Indirect foreign investment**

The establishment and fast expansion of stock markets in developing countries has in many cases aimed at attracting capital from abroad. Researchers have argued that in many cases this has proved to be a “fatal attraction” because of the financial booms and busts which these countries experienced due to capital flight. Opening up the economy to foreign investors can seriously damage economic development through several channels. Free movement of capital links two unstable markets: stock and currency markets. In the event of a shock the two markets may interact and produce even greater instability for the economy [Akyuz (1992)]. Furthermore, financial insulation allows the country to delink its interest rates from the international markets. This can allow the government to use its financial policies without any destabilising effects from abroad [Akyuz and Kotte (1991)]. If the economic system becomes unstable due to capital flight, aggregate investment is likely to decrease because of depressing business expectations. These factors can damage the real economy and reduce long term economic growth. Therefore, it could be beneficial if governments separated trade related financial transactions from capital transactions and insulated to a degree their economies from the latter<sup>15</sup>.

---

<sup>15</sup> As Cho and Khatkhate (1989) discuss, one reason liberalisation in several countries has had disastrous results is because the countries which implemented it were not mature enough to open up to the international markets. In their report, they argue that unless a country achieve macroeconomic stability and adequate financial depth, full liberalisation may not be the best policy.

#### **3.3.1.4. Financial deepening and the stock market**

Part of the criticism on the neo-classical propositions on “financial deepening”, is that they do not address the role of the stock market. For example, Shaw (1973) merely points out that the development of the stock market in developing economies could follow financial deepening as part of a well functioning financial market. However, the establishment of a stock market concerns long term investment and it could prove very expensive during the first stages of financial liberalisation. If anything, Shaw seems to be against the creation of a stock market in developing countries, at least until the economy has been allowed to operate freely without government intervention [“Creating new Wall Streets comes later, if at all.”, Shaw, (1973), p. 147].

An attempt to integrate the stock market in the neo-classical framework was made by Cho (1986), who argued that “substantial development of an equity market is a necessary condition for complete financial liberalisation” (p.192). Cho’s argument is based on the fact that equity finance is free from adverse selection effects and will enhance the allocative efficiency of capital since debt finance is problematic because of asymmetric information. Cho also suggests that in the absence of an active equity market, government intervention could be appropriate. As Singh (1992) points out, Cho’s propositions have a serious flaw. They assume that potential shareholders have the same information as banks. However, in the real world information is scarce and costly. Therefore, it is unlikely that a small shareholder will try to acquire such information. If the agency problem in management controlled corporations is added, then it is likely that the existence of a stock market can lead to even greater inefficiencies in the allocation of capital.

Another argument for the establishment of stock markets in developing economies is provided by Subrahmanyam (1975). Subrahmanyam provided a theoretical framework in which he examined the benefits of integration to individual investors under three forms of utility functions. His framework suggests that in each case, when two economies’ capital markets merge, the individual investors’ welfare always improves except for the case when the two capital markets are positively and perfectly correlated where there is no



change in investors welfare. However, this framework ignores several of the real world stock market features concerning integration, such as: capital flight, speculation and vulnerability of an economy to international instability [Cosh et al, (1989)]. When these factors are added to this framework, the results may change dramatically.

#### **3.3.1.5. The stock market in endogenous growth models**

During the last decade a booming literature of endogenous growth model has emerged. These models aim to overcome some of the problems inherent in neo-classical growth models. Specifically, the neo-classical model assumes that the economy will stop growing at some point unless it is stimulated by some exogenous technological progress [McCallum (1996)]. The endogenous growth models, use neo-classical assumptions to show that an economy can experience everlasting growth. There are several endogenous growth models, each modelling some internal mechanism which is the source of growth. In the present analysis, we are concerned with the family of endogenous growth models in which financial intermediation is modelled explicitly.

In these models financial intermediation enhances economic growth mainly in three ways: first, financial institutions pool funds and by predicting withdrawal demand they economise on liquid reserve holdings and direct these funds towards production. This effect is mainly attributed to the banking sector and it has been modelled by Diamond and Dybvig (1983). With respect to the role of the stock market, it provides liquidity to entrepreneurs when they need it, so they do not have to liquidate their investment. Similar models are presented by Bencivenga, Smith and Starr (1995, 1996). Their models focus on the effect of improved liquidity as transaction costs fall, to the savings rate of return and the growth rate of the economy, and show that under certain conditions, greater liquidity may result in lower growth rate. Levine (1991) develops a model where through the development of the stock market, agents avoid both liquidity and productivity risk. The latter refer to the ability to diversify.

Second, financial institutions acquire information which enables them to allocate capital efficiently. Probably the best known endogenous growth model in this area is the one presented by Greenwood and Jovanovic (1990). In their model, financial activity

develops as the economy develops. The most important role of intermediation is to collect and analyse information, thus facilitating the allocation of funds in projects with the highest return. Greenwood and Smith (1997) present two models where again, financial markets develop together with the economy. The first model can accommodate either banks or an equity market. It is shown that equity markets increase the economic growth rate if and only if, agents are sufficiently risk averse. In this case, if the economy was bank based, agents would be reluctant to invest their funds in physical capital. Their model may have implications for developing economies because it assumes that financial development requires some initial real development. This is because of the costs involved in establishing a financial market. According to this model, financial intermediation may not be appropriate if it is imposed by the government to promote growth. Instead, the economy should develop to such a degree that would result in an increase in market activity. The second model shows how intermediation can support specialisation which is important in economic activity. This model shows how resource allocation is done more efficiently through financial intermediaries.

Finally, investors can diversify through intermediaries, obtaining a higher and safer return. This results in increased investment and growth. Saint-Paul (1992) presents a model where the main feature driving economic growth is the possibility of diversification. Saint-Paul shows that in the absence of financial intermediation investors will choose “flexible” and poorly productive technologies. If the financial market is well developed, then they can diversify. In this case they will prefer specialised technologies which will boost productivity growth. Devereux and Smith (1994) and Obstfeld (1994) present two models which assume world market integration. Obstfeld shows that welfare increases through international diversification because the world portfolio shifts from safe, low-yield capital into riskier, high-yield capital. However, Devereux and Smith show that reduced uncertainty may reduce people’s propensity to save. In their model, there is a trade-off between reduced risk and lower savings. The latter can result in lower growth. In an earlier study, Devereux and Smith (1991), examine the effect of integration on different generations. They show that initially, global integration leads to higher welfare because the risk-sharing effect is larger than the growth effect. However, future



generations experience much lower economic growth rates than those that would occur under autarky.

Boyd and Smith (1996) construct a model in which borrowers can choose between debt and equity. Their decision depends on the amount of information that an investor needs in order to monitor the investment. More specifically, Boyd and Smith distinguish between three technologies which borrowers can utilise: a publicly available production technology which yields a return  $r$ , a production technology with which investors can monitor their investment without any cost (observable), which yields a return  $y$  and a production technology with which investors have to incur some costs in order to monitor their investment (unobservable) and which yields a return  $w$ . The cost that investors have to incur is denoted by  $i_t$  and is similar to the auditing cost that shareholders will have to incur if they want to monitor their investment. Borrowers can use any combination of the above three technologies and it is assumed that  $r < y < w$ . If borrowers choose only the unobservable returns technology, then they will finance their investment with debt. However, as technology becomes more complicated, monitoring costs rise and borrowers will switch to the observable technology, in which case it is optimum to issue some equity as well<sup>16</sup>. This allows for the development of the stock markets as the economy grows and becomes more complicated. Boyd and Smith show that to choose between the two technologies, borrowers have to maximise the expression:

$$q\rho_{t+1} \{ \theta_t \hat{y} + (1 - \theta_t) \hat{w} - r - i_{t+1} G[z(\theta_t; i_{t+1})] \}$$

where  $q$  is the maximum amount an investor can invest,  $\rho_t$  is the rental rate for capital at time  $t$ ,  $\theta_t$  is the proportion of total investment done in observable technology by a representative borrower and  $G[z(\theta_t; i_{t+1})]$  is the probability of the occurrence of monitoring costs. As the economy grows, the relative price of capital declines and the monitoring costs increase. Therefore, borrowers change the composition of their investment towards the observable technology. This results in less monitoring and the

---

<sup>16</sup> This result is based on the assumption that an observable return technology exists. In reality, as technology becomes more complicated and monitoring costs rise, investors are more likely to turn to debt instruments [Fry (1997)].

decline of the per unit costs of intermediation. The result is an increase in the proportion of funds invested in the equity markets ( $e/q$ ). Although the ratio of debt to equity will fall, debt and equity are complementary sources for the financing of capital investment. The role of the equity market in the economy according to this model, is to provide entrepreneurs with cheaper finance and thus, promote economic growth.

### **3.3.2. Stock market volatility and economic development**

The development of the stock market may also have an indirect effect on economic development through increased volatility. If the stock market becomes more volatile as it develops, it could undermine the whole economic system. Unstable prices can deter investment and give rise to speculation opportunities. Speculators will divert money from the production process and make the stock market even more volatile. However, stock market development does not have to increase volatility in the stock market. Instead it could reduce volatility by making the market more efficient and driving speculators out. Whether volatility will increase or not as the stock market expands is really an empirical question. The two main theories (neo-classical and post-Keynesian) are not very helpful at explaining how stock market volatility is affected by stock market development. The two following sections provide a discussion of the implications the two theories present with respect to the volatility of the stock market.

#### **3.3.2.1. The neo-classical argument**

The neo-classical theory on financial deepening suggests that financial deepening associated with financial liberalisation could reduce stock market volatility by increasing the number of shares and traders in the market. The neo-classicals argue that government intervention leads to distortions of financial prices. These distortions are the result of restrictions on market competition (e.g. interest rate ceilings, credit rationing, barriers to entry or exit markets). Deregulation and liberalisation can affect financial markets by allowing interest rates to raise to their competitive levels and therefore act as an efficient price mechanism [see Shaw (1973) and McKinnon (1973)]. This process should encourage investment and increase output growth which in turn should lead to increased investment and savings [Fry (1997)]. The role of the stock market in this scenario is to act as an efficient equity pricing mechanism which will act as a guide for resource



allocation. According to neo-classicals, this development process should enhance the role of the stock market through increased research and production and dissemination of information in the market place, which could result in the reduction of volatility of equity prices. This should encourage increased participation of both firms and investors in the stock market, which will eventually lead to reduced volatility of equity prices. Tauchen and Pitts (1983) present a model which shows that volatility is inversely related to the number of traders in a market. In their model, volatility consists of two components: a variance component common to all traders and a variance component relative to each individual trader. The more traders in the market, the more the trader specific variance reduces. However, as Kwan and Reyes (1997) argue, the variance components in this model may change after liberalisation due to different levels of uncertainty, so, whether volatility will increase or decrease is an empirical question.

However, even if volatility increases after liberalisation, this is not necessarily damaging to the efficiency of the market. Lamoureux and Lastrapes (1990a) show that, for 20 actively traded stocks from the S&P index, volatility is positively related to the information flow arriving in the market. Therefore, increased volatility could reflect increased information flow which can promote efficiency in a market. This hypothesis is also consistent with the neo-classical theory which suggests that financial deepening should encourage increased production and dissemination of information because of the profit opportunities which will follow financial liberalisation. Also, note that the capital asset pricing model suggests that if the markets are efficient, increased volatility should not affect macroeconomic performance [Chou, Engle and Kane (1992)].

#### **3.3.2.2. The Keynesian argument**

The post-Keynesian view assumes imperfect markets, particularly in relation to the availability of information to all participants. It assumes that investment is determined by “animal spirits”. Therefore, deregulation could attract speculators and investors with short term strategies who can introduce financial crises and economic instability. Furthermore, volatility can induce even more volatility. Since individual investors are mainly “ignorant” of the future, according to the post-Keynesian view, a change in their expectations which is not really relevant to the prospective yield, can bring violent

changes in the valuation of stocks, “since there will be no strong roots of conviction to hold it steady” [Keynes (1936)]. In this sense, financial liberalisation will increase volatility through increased liquidity. Keynes, (1936) regards liquidity as having a destabilising effect on the market because of the assumption of market imperfection. Therefore, an increased number of trading shares and investors can destabilise the market. Increased volatility can result to misallocation of savings and investment because of increased uncertainty. Advocates of the post-Keynesian view [e.g. Stiglitz (1994)] argue that government intervention can have a positive effect on the market because financial markets are subject to market failures that can produce externalities. Singh (1997) discusses the role of a stock market in a developing economy and concludes that the expansion of a stock market which results from financial liberalisation is more likely to damage than enhance economic growth. Most developing economies lack the necessary legal and regulatory infrastructure to ensure that their stock markets functions properly [Bekaert (1995), Cashin and McDermott (1995)]. Furthermore, equity prices in these markets are much more volatile than in developed markets. Singh argues that increased volatility can undermine the role of the stock market as a whole, since prices are no longer useful in resource allocation decisions and risk-averse firms could stop raising capital or even listing in the stock market.

### **3.3.3. Integration of the ESMs with the world market**

The third issue we examine considers the integration of the emerging stock markets with developed stock markets and with each other. Integration has several implications for the emerging economies and their ability to attract foreign investment. From a neo-classical perspective, as long as there are no barriers to investment between two countries, the rate of return offered by these countries should gradually become equal. This is the result of competition which is a central assumption in the neo-classical theory. The equalised rate of return is referred to as the normal rate of profit [Konz (1997)]. If capital can move freely between countries, the neo-classical theory assumes that convergence between the rates of return offered by these countries is inevitable. The same principle extends to the stock market. The only factor which should cause rates of return to differ across stock markets should be their individual risk. Integrated national stock markets should offer a common reward for the same risk [Bekaert (1995)]. If national stock markets are well



diversified and perfectly integrated then, similar assets should offer similar rewards and we should expect the market indexes to offer the same return over time.

Financial liberalisation can enhance integration which can assist stock market and economic development. Increased participation due to foreign inward investment, can enhance the liquidity of a market and prices will become less sensitive to the sale of equity [Pagano (1989)]. This in turn should decrease volatility which can affect negatively economic development. The increased activity in the stock market should induce more companies to seek a listing and the stock market will be able to provide the diversification, liquidity and informational benefits which promote economic growth [Hargis (1997)]. The increased investment will increase stock prices resulting in lower required rates of return for companies. Faced with the lower rates of return, companies can raise additional capital through the financial markets and increase aggregate investment in the economy.

The above scenario can materialise in a neo-classical world. In such a world, competition will ensure that rates of return will become equal. The emerging stock markets have attracted huge amounts of capital (see chapter 5). This implies that when they opened up to foreign investors, prices there were repressed and the capital inflows raised them until they corresponded to their individual risk level as it was priced in the world market. However, it has been often argued in the economic literature that this is not the case. Instead, the reason foreign investors entered the ESMs, was a misplaced euphoria and a herd instinct [Singh (1997)]. In other words, the fundamentals of the recipient countries could not justify the capital inflows. The money invested in these countries were simply chasing short term high returns or they were responding to the trend of investing in ESMs.

This view is supported by Krugman (1995) among others. Krugman states that 'It seems fairly clear that some of the enthusiasm for investing in developing countries in the first half of the 1990s was a classic speculative bubble.'[p. 35]. An example they use to support their proposition is the Mexican crisis in 1994 [e.g. Aitken (1996), Krugman (1995)]. It is argued that the Mexican crisis was caused by institutional investors who

entered the Mexican market for a quick profit. When the economy hit trouble, they liquidated their investment and send the money out of Mexico. If the speculative bubble theory is correct, then it is expected that the returns of the ESMs will not converge.

The speculative bubble scenario is only one reason why the rates of return offered by ESMs may not be converging. Another reason may be interference from the governments of the developing countries. If the liberalisation policies have not gone far enough to remove all barriers on investment flows, then the developing stock markets will have a different risk premium from the rest of the world for the same risk class [Hietala (1989), Korajczyk (1995)]. If residents are not allowed to invest abroad, they cannot diversify the country specific risk and they should demand a higher return on domestic securities than foreigners. Errunza et. al. (1992) developed a model which accounts not only for integration and segmentation, but also for mild segmentation. Their model is a modified International Asset Pricing Model.

Another reason why segmentation may persist, is because of the problems often presented in ESMs. Cashin and McDermott (1995) report that inadequate regulation and supervision of financial markets and poor quality of information are common features in emerging stock markets. The neo-classical theory assumes that capital will move in because of the higher rate of return offered by the markets. However, foreign investors should only move in if they have enough information to evaluate their investment. If the investment environment is not developed enough to allow an investor to evaluate and follow his preferred investment strategy, then it is possible that investors in these markets would demand a premium to invest there. Furthermore, the investment horizon would be shorter because of the uncertainty associated with the problems inherent in undeveloped stock markets. One would expect that such markets are segmented because of a lack of foreign capital involvement.

Integration of the ESMs with the world stock markets implies that the ESMs can contribute positively to economic growth. On the other hand, segmentation would imply that either these markets have been used by foreign investors for speculation, or the liberalisation reforms have not gone far enough to eliminate any barriers in capital flows.



Alternatively, it could be that the ESMs in some countries are not sophisticated enough to provide foreign investors the services that developed stock markets provide. In any case, if the markets are segmented they could be caught in a low equilibrium trap [Hargis (1997)], i.e. in a situation where few money is invested in the stock market making it illiquid and risky. It is then expected that such a stock market cannot enhance economic growth, but rather hinder economic growth through volatile prices, illiquid investment and speculation.

### **3.4. Our research questions**

The financial liberalisation thesis has been the cornerstone of the financial liberalisation reform policies which have been implemented in several developing countries during the last twenty years. The liberalisation thesis which advocates the abolition of interventionist policies is largely based on the neo-classical model. One of the reasons these policies were implemented in several countries was because they needed foreign aid and the IMF imposed conditions on the loans or made suggestions which would make the country which followed the suggestions a better candidate for aid. However, a lot of these policies are controversial and not strictly based on some theoretical model. In effect, the McKinnon - Shaw propositions were used in order to suggest wide scale liberalisation of the emerging economies<sup>17</sup>. There is now controversy surrounding the way the liberalisation policies were suggested to these countries and implemented, especially with respect to the stock market. What is interesting is that the controversy comes not only from economists against liberalisation but also from advocates of the liberalisation process<sup>18</sup>.

Clearly whether the reform policies work or not is an empirical issue. There are dozens of issues involved and in this thesis we aim to examine three of them: the effect of stock markets development on the economic development of selected emerging economies, the

---

<sup>17</sup> For example, the stock market development which started in the early 1980's is justified in the academic literature by Cho's article which was published in 1986. Prior to this, there was no theoretical argument for the creation of a stock market in the developing countries.

<sup>18</sup> For example, Fry (1997) supports the financial liberalisation theory but not the development of stock markets in the emerging economies.

change in the nature of stock market volatility following liberalisation and the change in the degree of integration (or segmentation) of national ESMs after liberalisation.

First we test if stock market development had an effect on economic growth. To test this we utilise the Boyd and Smith model described earlier. According to the model, economic growth ( $EG$ ) is a positive function of stock market development ( $SD$ ) and the banking sector development ( $BD$ ):

$$EG = f(SD, BD)$$

Furthermore, as the economy grows, economic development should result in stock market and banking sector development; therefore, the above equation is bi-directional. The banking sector and the stock market are complimentary sources of finance in this model. However, at the early stages of development a substitution effect takes place because debt is exchanged for equity. This implies that for most countries in the sample we could find a substitution effect. If the model holds we should be able to find evidence to support the above relationships and provide some justification for the rapid expansion of the stock markets in several developing countries.

Second we examine if volatility increased after foreign investors were allowed to invest in these markets. Our tests will look at the change in the nature of volatility rather than volatility *per se*. This should give us more information about how the opening up of certain markets to foreign investors affected the volatility of stock returns. The tests should provide evidence as to whether the effect of liberalisation on stock market volatility is positive or negative.

Finally, we test for integration across emerging stock markets. We shall test for regional integration first, i.e. integration across the Latin American stock markets in our sample and integration across the Asian stock markets in our sample. Then we shall test for integration of these markets with two developed ones. The results should provide evidence on whether these stock markets developed enough after liberalisation so they



could enhance economic growth, as well as on a number of relating issues such as the potential for diversification and efficiency.

### **3.5. Summary and Conclusions**

From the above discussion, we can see that the financial liberalisation propositions have their foundation in the neo-classical theory of free markets. The liberalisation reforms have been implemented in several countries, at the suggestion of the IMF and the World Bank. These reforms and the way they were implemented have attracted fierce criticism from several economist, even from advocates of the free market.

A major subject of controversy is the usefulness of the development of a stock market in an a developing economy. A lot of advantages and disadvantages have been cited in the literature. One of the problems surrounding stock market development is that it was ignored by the early literature which proposed financial deepening. Although an early analysis on the benefits of the creation of a stock market in developing economies was missing, several of these countries either promoted the development of, or created a stock market. In this sense, any theoretical developments in the area followed the creation of the stock markets. Whether these stock markets assisted or hindered economic growth in the developing countries is an empirical matter which will be examined in the following chapters.

The effect of the stock market development on economic growth can be direct or indirect. We first perform a general cointegration test to examine this effect. We utilise the Boyd and Smith model and we examine not only the interaction between the stock market and the economy, but the role of the banking sector as well.

The stock market can also have an indirect effect on the economy through the volatility of stock prices. Increased volatility could undermine the whole economic system by undermining investment through increased risk. In this thesis we examine if the nature of the volatility of stock prices changed after foreign investors were allowed in these markets.

Finally, a national stock market should integrate with the world capital markets in order to assist economic growth more effectively. Integration can help the stock market grow and develop the characteristics which make it a useful instrument for economic growth. Therefore, we test for integration across the emerging stock markets before and after the liberalisation policies were implemented. Before we discuss the methodologies we employ to test the above hypotheses, we critically review the empirical research on the issues we examine.



## **CHAPTER 4: EMPIRICAL RESEARCH ON EMERGING STOCK MARKETS**

### **4.1 Introduction**

The literature review presented here concentrates on the three issues which we will examine empirically: emerging financial markets development, emerging stock market volatility and integration among national ESMs. The latter issue has implications for the diversification benefits offered by these markets and the efficiency of these markets. Efficiency is of interest for our entire analysis because if a stock market is to act as a pricing instrument it should be efficient up to some degree. Efficiency is implicated in the analysis of volatility because efficient stock markets are not usually volatile. We begin the discussion with an overview of the development of the emerging stock markets and some definitional issues.

### **4.2. The development of emerging stock markets**

Up to the early 1980s, commercial banks have traditionally provided investible funds in many developing economies, while the local equity markets have been relatively inactive. This was mainly the result of macroeconomic and regulatory policies which did not encourage the private sector to play an active role in the economy. High fiscal debts, high inflation, low or negative real interest rates, the dominant role of the public sector and quantitative restrictions on the availability of credit were the main reasons for the inability of the private sector to contribute to national economic growth. In addition, high taxes on dividends and capital gains, inadequate regulation and supervision of financial markets, the poor quality of dissemination of information and barriers to inflows of foreign capital all contributed to a low demand for equity finance [Cashin and McDermott (1995)].

Emerging stock markets (ESMs) have received increasing attention by investors and academics since the early 1980s. There is no universally accepted definition of what is an ESM. The term ESM is not a parallel to emerging economies, according to Errunza (1983) although there is an obvious relationship (a stock market is considered as an indication of development for emerging economies). The most widely accepted definition of an ESM is the one given by the International Finance Corporation (IFC). The IFC classifies countries according to their per capita GNP, which is also the classification used by the World Bank. So, according to the IFC, ESMs are stock markets in countries with low-to-middle per capita income, which in 1992 meant a per capita GNP of less than US\$8,356. However, as Barry and Lockwood (1995) report, investors focus on those developing countries in which capital markets are advancing in size, activity or sophistication. The definition usually used by investors and academics is that an ESM is an active stock market not big or accessible enough to be considered as a developed market. So, for example, Greece [with a per capita GDP of US\$5,500 in 1990 and the World Bank limit being at US \$2,200 as Bekaert and Harvey (1995) note] is included in the IFC indices and is characterised as an ESM in various studies. Other definitions of what an ESM is can be found in the literature [e.g. Divecha et. al. (1992), Errunza (1983), Taliente and Fraser (1995)]. However, it is very difficult to find an exact definition of an ESM, since the markets which are described as emerging today vary widely in their structure, performance, prospects and principal features [Barry and Lockwood (1995)].

Investment flows to ESMs have increased dramatically during the last decade. By 1992, these flows were over \$35 billion from four major industrial countries (Canada, Germany, Japan and US), compared to US\$8.2 billion in 1988 [Chuhan (1994)]. According to Forbes magazine, investment flows in ESMs in 1993 were US\$92 billion [Taliente and Fraser (1995)]. Five countries (Argentina, Brazil, Mexico, the Republic of Korea and Turkey) account for two thirds of the portfolio flows to developing countries between 1989 and 1993 [Gooptu (1994)]. One of the largest recipient of foreign capital was Mexico. In 1992, nearly 60 percent of US residents' portfolio flows to developing countries were to Mexico. In 1994, investment flows in ESMs declined. As Gooptu (1993) reports, it is difficult to measure the composition of foreign portfolio investment



in developing countries due to the existence of several estimates of these flows by reporting agencies, with none of the data sets being compatible.

The effect of these flows was an increase in the number of companies listed in ESMs from 12,904 in 1990 to 15,370 in 1993. The market capitalisation of these companies increased from US\$429 billion in 1990 to US\$2.2 trillion in 1993, which corresponded to a 16% share of the total world equity markets' capitalisation [Taliente and Fraser (1995)]. Barings Securities estimate that this percentage will rise to 44% by the year 2010.

The equity market growth and internationalisation of finance can help developing countries in several ways: first, they can attract capital to finance productive investment activities. This came at a time when there were increasing pressures on industrial countries for aid budgets<sup>1</sup>. The process of capital market growth has also facilitated price signalling in developing countries, which had been disrupted by quantity rationing of capital. Furthermore, a well-functioning price mechanism enhances the scope for efficient mergers and acquisitions and can contribute to a more efficient allocation of capital. Through stock markets, investors can diversify reducing this way the risk they bear. This results in lower risk premiums demanded and therefore lower cost of capital [Claessens (1995), Kim and Singal (1993)].

In the case of developing economies an interesting question is how useful the stock market has been to firms for raising capital. Singh and Hamid (1991) examine corporate capital structures in nine developing countries. They find that firms in developing countries rely to a much greater extent on the stock market for capital than firms in developed countries. Demirguc-Kunt (1992) examines the corporate capital structure in the same nine countries and confirms the above results. Demirguc-Kunt also examines whether debt and equity in these countries are substitutes or complements. His results suggest that debt and equity are complementary, so, the development of the stock market has increased the borrowing capacity of firms with the availability of equity financing. Demirguc-Kunt also suggests that the development of the stock market may be

---

<sup>1</sup> A brief discussion of the background of the economic relationship between industrial and developing countries is given by El-Erian and Kumar (1994).

beneficiary for industry because it provides banks with good quality information about firms, so banks may be able to assess creditworthiness more accurately, increasing their lending.

These results are confirmed by Demirguc-Kunt and Maksimovic (1996), who examine the financial structure of firms in thirty countries from 1980 to 1991 and find that the financing choices of firms differ between firms in developed and developing countries. In developing countries, large firms increase their leverage as the stock market develops. A possible explanation is that large firms usually publicise more and better information at the early stages of stock market development. They also improve monitoring and corporate control in order to attract investors. This provides an incentive for creditors to lend more. In this sense, banks may actually benefit from the development of the stock market as they can assess creditworthiness easier and expand their lending. In developed countries, as stock market develops more, the process is inverted: large firms shift from debt to equity. In their sample, Demirguc-Kunt and Maksimovic find no effect of stock market development on small firms. Singh (1992) argues that debt and equity are in fact substitutes since there is no evidence that aggregate savings in developing countries increased [see also: Cho and Khatkhate, (1989)]. In some countries, aggregate savings actually fell during the 1980s. As for the role of the stock market in increasing efficiency in resource allocation, Singh argues that share prices in these countries are too volatile to be used as information about firms' prospects. However, the main role of these stock markets was to attract foreign investment at a time when the prospects of raising additional debt were rather slim.

#### **4.3. Foreign investment in ESMs**

Since the early 1980s, ESMs have received increasing attention by investors. Investment in ESMs was facilitated by the IFC, which provided information about these markets. Towards the end of the 1980s ESMs were recognised as an investment category by investors. Two funds were set up (Templeton ESMs Investment Trust and Genesis ESMs Fund) which exclusively invested in ESM, thus providing investors access to these



markets and saving them the hazards of investing in foreign countries where little information is available [Dunham (1989)].

There are several factors which attracted foreign investors to ESMs which can be classified as “pull” and “push” factors [Gooptu (1993)]. “Pull” factors refer to country-specific factors and “push” factors refer to global factors which made investment in ESMs favourable.

#### **4.3.1. “Pull” factors**

Two are the major “pull” factors: high returns and diversification benefits. The outstanding return performance of ESMs has been documented in several papers [e.g. Gooptu (1993), Mullin (1993)]. Historically, ESMs have had much higher returns than developed markets. Gooptu (1993), distinguishes between two classes of investors who aim at higher returns by investing in ESMs. Individual foreign investors and domestic residents of developing countries with overseas holdings, managed funds, foreign banks and brokerage firms, and finally purely speculative traders, all belong in the class of investors who move funds from country to country chasing high returns in the short term. Institutional investors and non-resident nationals of developing countries are in the class of investors with long term investing horizons. High returns in emerging economies derive from the high growth rate which some of these countries experience [Fischer and Reisen (1994)].

The diversification benefits from the inclusion of ESMs’ equity in the world portfolio have also been well documented in the literature [e.g. Divecha *et. al.* (1992), Harvey (1995), Wilcox (1992)]. Several studies report low correlations between developed and ESMs. Also, Errunza and Padmanabhan (1988), report that although currency risk is an inhibiting factor in investment in ESMs, the benefits for the global investor are still sizeable. Because there are several issues surrounding global diversification, it is discussed separately (section 4.7).

Another “pull” factor is the reforms that ESMs have undertaken in order to develop the role of their stock exchange [Claessens (1995), El-Erian and Kumar (1994), Gooptu

(1993)]. Such reforms include deregulation and liberalisation of the stock market, improved supervision of stock market activity, increased information flow and improvement of the legal infrastructure which aims to protect investors. Pardy (1992) provides a framework of the institutional reforms which are necessary to ensure the smooth development of the financial market in developing countries. Another “pull” factor reported by Chuhan et. al. (1993), is the credit rating of available investments in ESMs. In their study they find that Asian countries are much more sensitive in credit rating than Latin American countries. Several developing countries adopted credit enhancement techniques, like collateralisation, which provided a means of reducing credit and transfer risks [El-Erian and Kumar (1994)].

#### **4.3.2. “Push” factors**

There have also been “push” factors in equity flows to ESMs, which are weak domestic asset markets and declining interest rates in developed countries [Calvo et. al. (1993), Chuhan (1994)]. In the early 1990s interest rates and industrial production declined world-wide (e.g.. the 3-month US Treasury Bill rate fell from 5.9% in 1988 to 3.3% in 1992). This forced investors to look outside their national borders for high return investments and restructure their portfolios by including risky assets such as ESMs’ equities [Solinger (1994)]. Placing private securities in the US market was also facilitated by the introduction of Rule 144a, in April, 1990, which liberalised the private placements market by providing a safe harbour from registration requirements for the resale of securities to institutional investors. Rule 144a freed investors from having to hold the securities for two years before they can sell them.

#### **4.3.3. ESMs weight in foreign portfolios**

Although the flow of capital to ESMs increased, these flows represented a small percentage of the total assets of the major world investors (US, UK, Germany and Canada). Less than 5 percent of their foreign equity holdings were invested in ESMs in 1992 [Chuhan (1994)]. However, because of the small market capitalisation of these countries, even a marginal increase in investment from the major players in the world market has a significant effect in these economies. Because of this effect, developed countries’ institutional investors have gained power in controlling emerging countries’



government policies. As Taliente and Fraser (1995) report, in March 1994, after the assassination of the Mexican presidential candidate, Luis Donaldo Colosio, US fund managers became worried about the sliding peso. They contacted the Mexican central bank, suggesting measures which should stabilise the currency. The choice for the central bank was either to follow the suggestions so that fund managers not only would not sell their Mexican holdings but they would make additional investment, or not follow the suggestions and lose the capital inflows. The latter meant that relationships between Mexico and US investors would deteriorate and as it was estimated by one of the fund managers, this could cost Mexico US\$30 billion off its GDP.

#### **4.3.4. Foreign investors and speculation**

Since investment in emerging markets attracted attention, foreign investors' behaviour has been characterised as irrational and herd-like by several financial publications. Examples cited in the literature of such behaviour have been the "tequila effect" in December 1994 and the dramatic collapse of the South East Asian stock markets in 1997 [e.g. Aitken (1996), Krugman (1995)].

A variance ratio test for the composite IFC index, the IFC Latin American index and the IFC Asian index, shows that the variance ratio is higher for the indexes than it is for their respective individual countries [Aitken (1996)]. This implies that fund managers view ESMs as a different asset class since the autocorrelation of the indexes is higher than the autocorrelation of the individual markets. This finding is consistent with Buckberg's (1996) results, and can perhaps help to explain bubbles in ESMs (if they exist). Fund managers who lack the knowledge needed to assess the future performance of ESMs, decide what proportion of their funds to place in these economies and then spread these funds over a portfolio of stocks so as to receive the risk/return benefits of international diversification. When ESMs performance falls below expected levels, instead of shifting from one ESM to another, fund managers shift out of ESMs altogether since they perceive them as an asset class. An example of such behaviour used by advocates of the existence of bubbles in these markets, is the December 1994 "Tequila effect". The peso devaluation reflected fundamentals about the Mexican economy only. Although Mexico represented less than two per cent of global stock market capitalisation, other developing

countries' stock markets experienced a dramatic decline because of the Mexican financial crisis.

Buckberg (1996) tests the application of the CAPM on 13 ESMs versus a two-factor model including the world portfolio return and the returns on a IFC index. Buckberg finds that the two-factor model is more powerful in explaining returns in most of the countries used in the test, compared to the CAPM. This result also indicates that ESMs are treated by investors as a separate asset class.

Gooptu (1994) finds that the flows going to a region are correlated ("contagion effect"). His findings suggest that investors do not choose specific countries to invest but regions. Such investing behaviour is rather surprising considering Harvey's (1995) results of very low return correlation among ESMs of the same region (e.g. Argentina and Brazil, 3%, Colombia and Chile, 0%). Gooptu, also finds evidence which suggests that ESMs have to compete with each other to attract funds. The hypothesis examined is whether financial flows to ESMs come from an increasing pool of investible resources or whether it is the same funds (e.g. "hot money") chasing higher returns from country to country. Gooptu concludes it is the same funds which go around countries which means that investors are generally not committed in long term investments in these markets. However, Claessens, Dooley and Warner (1995) find no evidence of "hot money" going around countries, chasing high returns.

#### **4.4. ESM development and economic growth**

Whether or not ESMs are only used for speculation, as Singh (1992) states, they are: "...today a part of the new economic landscape and, notwithstanding their dubious merits in relation to economic development, they are here to stay" [p. 44]. The question therefore, is if they have contributed to the economic growth of their respective countries or not. On an empirical level, most studies examining the relationship between financial development and economic growth in developing economies focus only on different measures of money as a proxy of financial intermediation [e.g. De Gregorio and Guidotti (1995), Demetriades and Hussein (1996), Demetriades and Luintel (1997), Ghani (1992),



King and Levine (1993), Odedokun (1996)]. The most common measure of money in these studies is the ratio of M2 or M3 to GDP. These studies employ a wide range of methodologies to examine the hypothesis and the result seems to be always the same: financial development is positively related to economic growth.

The only exception seems to be Ram (1999) who finds that the relationship between financial development and growth is negative and for most countries insignificant. Ram estimates the coefficient of correlation between financial depth (as represented by the ratio of liquid liabilities to GDP) and growth of real GDP and finds that from the 95 countries in the sample, correlations were negative for 56 and positive for 39. From those 39, only in nine countries were the positive correlations statistically significant. Ram goes on to estimate the correlation coefficient between the same variables but using a cross section technique and finds a positive and significant correlation. He concludes that the positive relationship in cross country studies is an artefact which does not reflect the relationship between financial development and growth. Ram also uses Odedokun's (1996) specification where he replaces the financial development variable with his financial depth variable and finds that the positive relationship between financial depth and growth reported by Odedokun disappears.

However, most researchers find that financial development causes economic growth. Also, Demetriades and Hussein's findings suggest that the relationship is bi-directional. While these results are evidence against government intervention in the economy this is not to say that a free economy can always lead to higher levels of growth. De Gregorio and Guidotti find that increased financial intermediation can lead to a lower level of growth if an inadequate regulatory framework exists (like, for example, in Latin America during the 1970s and 1980s). As Demetriades and Hussein report "There can, therefore, be no "wholesale" acceptance of the view that finance leads growth as there can be no "wholesale" acceptance of the view that finance follows growth". This view is reinforced by Arestis and Demetriades (1997) findings in their examination of the relationship between financial development and economic growth in South Korea. Their findings suggest that financial repression affected financial development and economic growth positively. However, Arestis and Demetriades recognise that the South Korean case is

unique and financial repression has not actually worked for other economies. Therefore, it is widely supported that policy reforms that foster financial development have a significant positive effect on GDP growth [Ghani (1992)]. Further evidence against financial repression are provided by Roubini and Sala-I-Martin (1992) and Fry (1997) who find that financial repression affects growth negatively in a large sample of countries.

With respect to the stock market, few studies have examined its role in economic development in emerging economies. Chatrath et al. (1997) and Mookerjee (1988) examine the relationship between real economic activity and stock returns in India. This relationship is particularly important if we accept that stock prices affect investment<sup>2</sup>. If this is the case, then the value of the stock market would lie with its ability to predict real economic activity. If, instead, the stock market is informationally inefficient with respect to real economic activity, it will convey the wrong signal to investors and affect investment negatively. Both studies find that the Indian stock market is inefficient. Stock returns are positively correlated with real activity, but they lag real activity up to six months.

In a recent article, Levine and Zervos (1998) examine whether measures of stock market development are robustly correlated with current and future rates of economic growth in 47 countries using cross country regressions. In doing so, Levine and Zervos include a measure of banking sector development in their regressions (as measured by bank loans to private enterprises divided by GDP) in order to account for the separate effect of the banking sector in the economy. Their analysis is innovative in this area, for two reasons. First, they use different measures of stock market development to provide evidence on a variety of theoretical models. They proxy stock market development by using measures of stock market liquidity, size, volatility and integration with world capital markets. This way they can provide evidence on the features of a stock market that affects an economy. Second, in running their regressions they use different proxies for economic growth. More specifically, growth is proxied with four separate indicators: output growth, capital

---

<sup>2</sup> There is evidence that stock prices affect investment in developed countries in which the stock market plays an important role in the economy [e.g. Mullins and Wadhwani (1989)].



stock growth, productivity growth and savings growth. These four variables (together with economic and social indicators which are conditioning variables) enter the regressions as dependent variables. This way, Levine and Zervos examine not only if stock market development affects economic growth but through which channels it affects growth.

Their findings suggest that stock market liquidity and banking sector development are positively and robustly correlated with rates of economic growth, capital accumulation and productivity growth. Furthermore, they fail to find any evidence that savings or long run growth are negatively affected by stock market liquidity, volatility or integration with international capital markets. Their results support the models which show that stock market development is an integral part of the growth process and they call for theories which incorporate both stock markets' and banks' development as part of the growth process. This is particularly important because their results show that the two financial sectors provide different services in the economy (since they are both significant in the regressions).

Atje and Jovanovich (1993) examine the effect of stock market development on the level and the growth rate of economic activity in several developing and developed countries, for the period 1980-1985. Stock market development is proxied by the ratio of the annual value of all stock market trades to GDP. Their results suggest that there is a substantial positive effect of stock market development both on the level and the growth rate of economic activity. Atje and Jovanovich, also examine the effect of bank credit on economic activity and find that it is insignificant.

Similar evidence is presented by Levine and Zervos (1996). They examine the effect of stock market development in forty one countries from 1976 to 1993. Their study differs from that of Atje and Jovanovich in that Levine and Zervos use an index of several variables to measure stock market development (these variables measure size, liquidity and integration with world markets), and that they control for other variables which may have affected economic growth during that period (these variables include education, initial income, political instability, government consumption, inflation and the black market exchange rate). Their results suggest that the stock market is strongly linked to

long run economic growth. However, the above studies use pooled cross-country data and their methodology has several limitations, as Levine and Zervos acknowledge. Aggregation across countries cannot account for policy changes and differences across these countries. Furthermore, cross country regressions cannot resolve issues of causality (although, because of the methodology followed by Levine and Zervos, the statistical significance of the stock market measurement in explaining economic growth implies that stock market development does not simply follow economic development). Any significance of a variable in explaining economic growth should be viewed only as a partial correlation to be investigated further. Levine and Zervos (1993) discuss the problems of interpreting results from cross-country regressions and provide a guide for examining the validity of any results obtained with this methodology. However, they conclude that there is indeed a positive relationship between financial development and economic growth.

The problem with the existing empirical literature on the interaction between the stock market and the banking sector and their effect on economic growth is quite clear. There is a gap in this area especially with respect to the developing economies. Most studies in the literature examine the effect of either the stock market or banks on the real economy, but do not include both in a model [except Levine and Zervos (1998)]. Also, there is a lack of studies using time series analysis which can overcome the problems of cross country analysis. Our analysis, aims to contribute towards filling this gap by examining the interactions between the two financial sectors (stock markets and banks) and their effect on the real economy. The methodology we employ is different to the cross country regression employed elsewhere in the literature because of the problems associated with this particular methodology. We feel that exploring this area is of particular interest due to the increasing development of stock markets in a number of developing countries.

#### **4.5. Volatility in ESMs**

One issue directly related to the merit of ESMs in relation to economic development, is their volatility. It has been argued in the literature that volatility could increase following



liberalisation. If this is the case, it will be more difficult for the ESM to assist the economic development of their countries.

Several researchers have taken the view that investment in ESMs is a classic speculative bubble [e.g. Krugman (1995)]. According to this view, foreign investors rushed “lemming-like” to buy equities in ESMs and this “herd-like” behaviour has resulted in boom and busts like the “tequila effect” in 1994 [Aitken (1996)]. If the result of financial liberalisation is indeed increased volatility, it could have deleterious effects on the macroeconomy via increased financial fragility.

Grabel (1995), examines the above arguments by constructing volatility indexes for the two different theories. Neo-classicals believe that assets yield some “normal” return over time which is based on fundamentals. Deviations from this return are the asset’s return volatility. Keynesians suggest that asset return volatility is given by the fluctuations in the asset’s returns (e.g. in the form of standard deviation). Grabel examines both propositions for six ESMs for the periods around liberalisation in each country. The results for all volatility indexes are consistent with the view that volatility in ESMs did increase after liberalisation. This view is also confirmed by Aitken (1996), whose tests support the view that foreign institutional investors have had a destabilising effect on ESMs. Aitken’s results, based on the variance ratio, suggest that financial liberalisation has resulted in a price behaviour which is consistent with speculative bubbles. It should be noted, however, that even if volatility has increased in ESMs after liberalisation, this could be a result of more and quicker information flow. Therefore, if a market develops, in the short run higher volatility should be expected [El-Erian and Kumar (1994)].

However, there are several researchers who argue that volatility in ESMs has fallen since they opened up to foreign investors. Richards (1996) conducts tests for volatility on weekly and monthly data from 16 ESMs and 16 developed markets. He concludes that volatility has actually fallen in ESMs during the last years. Even after the Mexican crisis, volatility still did not increase considerably. Richards suggests that these markets were always more volatile than developed markets but, it is only lately that investors deal with them. Therefore, although the volatility was always there, it is only now that it has drawn

attention. Also, Levine and Zervos (1998) fail to find any negative impact of stock market volatility on any of their economic growth indicators, using cross country regression on a sample of 47 countries.

Kim and Singal (1993), also report lower volatility in 16 countries after liberalisation. Furthermore, evidence from the Korean market given by Jun (1993) indicate that there is only a marginal impact of capital flows on monthly volatility. The above results are confirmed by Bekaert (1995) who finds that openness of the markets he examines is not related to volatility and Tesar and Werner (1995) who conclude that although US investment in ESMs is more volatile than in other foreign equities it has not increased volatility in these markets. Actually, Bekaert finds that volatility is negatively - although not significantly - correlated with the measures of market integration he uses.

Claessens, Dooley and Warner (1995) examine inflows in five ESMs and conclude that there is no distinction between short and long term capital. The time series statistics are the same and there is a substitution effect: when an amount of short term capital leaves the country, a same amount enters the country as a different type of short term capital. Therefore, the only meaningful indicator is the amount of overall capital account and there is no volatility due to “hot money”. The implications of this study for policymakers is that any policy which aims to control short term capital may be misguided. Policies which aim to control the overall capital account may be more appropriate [Claessens (1995)].

Furthermore, Kim and Singal (1993) examine capital flow volatility before and after liberalisation for 14 countries and find that there is no increase in fund flow volatility after liberalisation. The above results indicate that market openings are good for market volatility. However, Velasco (1993), commenting on the article by Kim and Singal (op. cit.), argues that this may not be the case. Although volatility may have not increased after liberalisation, the level of funds entering and leaving the country may be so high as a share of GDP, that could seriously damage macroeconomic stability. Velasco (op. cit.), also questions the validity of tests which aim to examine the situation before and after liberalisation, since it is impossible to determine the correct cut-off date. This problem is



addressed by Gabel (1995), who omits one third of the observations of her sample, in order to eliminate the transition period.

Bekaert and Harvey (1997) also consider the problem of timing, and divide their sample into four subperiods: before (more than 30 months before liberalisation), pre- (30 to 6 months prior to liberalisation), mid- (6 months prior to 3 months after liberalisation) and post- (four months after liberalisation to the end of the sample period). The results suggest that volatility has decreased after liberalisation. The advantage of this study, is that it also accounts for other events that may have affected volatility but have little to do with liberalisation. Such events include asset concentration, development and integration of the markets, microstructure and macroeconomic stability. They find that development and integration as measured by the size of the trading sector as well as macroeconomic stability as measured by foreign exchange rates are significant in explaining volatility. Mullin (1993) also examines the causes of volatility in developing markets from 1976 to 1991, irrespective of foreign investment. He finds a significant relationship between return volatility and the volatility of inflation, real exchange rate changes, export growth and dividend-per-share growth in US dollars. In this case, macroeconomic stabilisation policies could reduce stock market volatility in these markets.

Another concern expressed by Velasco (1993), is the long term effect of financial liberalisation on volatility. More specifically, the worrying effect of market openings may be long swings in prices followed by crashes later on. Richards (1996), finds some evidence of returns reversals in ESMs, but not full mean-reversals. When compared to mature markets, ESMs demonstrate larger reversals which appear more quickly (maybe because of illiquidity, prices cannot remain far from fundamentals for long periods). However, there is not much difference in returns reversals between ESMs and smaller mature markets.

Most of the above models, examine volatility in ESMs using static models. These results are not informative of the nature of the volatility in these markets and its effect on stock returns. Furthermore, since there is evidence that returns' distributions depart from normality [Harvey (1995a), Bekaert and Harvey (1997)], alternative models are needed to

examine volatility in these markets. Our analysis overcomes this problem by utilising a GARCH process. The ARCH family of processes is a family of models which has been known to successfully capture stock returns volatility. Furthermore, the process is dynamic and is able to explain changes in volatility over time and to capture leptokurtosis, skewness and volatility clustering.

Choudhry (1996), examines volatility in six ESMs using a GARCH-M model (an extension of the GARCH model) for the period 1976-94. In the GARCH-M model the conditional mean is a function of the conditional variance. Choudhry, examines whether the nature of volatility changed in these markets after the October 1987 crash. The only results which apply to all markets are: there is an inverse but insignificant effect of volatility on stock returns and there is no evidence of time-varying risk premia. There is evidence of changes in volatility persistence before and after the crash, but results vary between individual countries. A modified GARCH-M model is also used by Fraser and Power (1997) to examine the impact of information arrival on volatility in five Pacific Rim countries and two developed countries from 1988 to 1994. The factors acting as information in this study are unanticipated news and past performance. Fraser and Power find that volatility can be predicted in three markets based on past market performance. Also, volatility in the Australian market is related to current and lagged news arrival. Fraser and Power also report volatility clustering for the Malaysian and Singapore equity markets, indicating that these markets are integrated. However, they fail to find any other correlation among the markets in the Pacific Rim. Bekaert and Harvey (1997) also find varying results in their examination of the forces that determine volatility in 20 ESMs. They find that individual markets' volatility is differently affected by world factors and there is also a difference in the time variation of this effect. Clare et. al. (1997) examine the seasonal patterns of the conditional volatility in five Asia-Pacific markets and find that conditional volatility is higher on Mondays.

Most researchers' attention is drawn to the opening up of the ESMs and the effect it had on the volatility of these markets. However, Bekaert and Harvey (1997), perform a cross sectional analysis of volatility for 20 countries and their results cannot establish a relationship between macroeconomic stability and stock market volatility.



A study by Kalotay and Alvarez, (1994) suggests regional co-operation as a way of protection of small stock markets from excessive volatility due to foreign capital flows. Instead of setting up individual stock exchanges, ESMs with relatively small size and capitalisation could set up regional stock exchanges. One of the benefits of this scheme could be the strengthening of the developing country's ability to cope with volatility "contagion" effects from international markets.

#### **4.6. Integration of emerging and developed markets**

Even if the ESM do not set up regional stock markets, eventually their stock market should integrate. In other words, stock markets which open up to foreign competition should follow a common trend with other open national stock markets in the long run, as a result of increasing integration [Kasa (1992)]. There are several ways to test for integration versus segmentation of stock markets, the most popular of which are reported in Claessens (1995).

One way is to explicitly model the barriers to investment and test whether the model applies to individual markets. The problem with this approach is the risk of misspecification. First, there are too many barriers to be considered. It is likely that in any model there will be missing barriers. Second, it is difficult to quantify these barriers. Therefore, rejections could be attributed to either lack of integration or the model itself. A theoretical framework which incorporates the hypotheses of integration, mild segmentation and complete integration was developed by Errunza and Losq (1985). Errunza, Losq and Padmanabhan (1992), use this framework to test the degree of integration in 8 ESMs. The barrier considered in this framework is restrictions to capital flows. They conclude that five of the markets are mildly segmented, two are either mildly or completely segmented and one (India) rejects all hypotheses. The results for India suggest that a more appropriate test for market integration has yet to be defined. Furthermore, their results may be problematic because the proxy used for the world portfolio is the US market which at the time represented only two fifths of the world capitalisation [Buckberg (1995)].

Another way is to assume that a particular model holds; rejection of the model would imply segmentation. Again there is the risk of misspecification since there is not a universally accepted international asset-pricing model. Another problem with this approach is that it encompasses only the two polar cases, i.e. complete integration versus complete segmentation. Buckberg's (1995) tests for market integration suggest that '...once foreign investors "discover" an ESM, it quickly becomes part of the global market' (p. 63). From the 20 markets examined, 18 do not reject a conditional ICAPM model for the period 1985-91 but, reject it for the earlier period 1977-84. However, in a later paper (1996), Buckberg finds that an asset pricing model with two factors (world portfolio returns and IFC index) for the period 1989-1995, dominates the CAPM, especially for the period 1992-95. An ICAPM model is also used from Jun (1993), for the Korean market. The results depend on the variable used as a world portfolio. When the IFC index return is used, the estimated beta increases after liberalisation; when the MSCI index return is used, the estimated beta is insignificant.

Harvey's (1995) results for a single factor model indicate that ESMs are not integrated with the world markets for the period 1976 to 1992. Harvey uses constant betas and expected returns in a model where the benchmark is the MSCI world market portfolio. His estimation of five-year rolling correlation measures of the local market returns and the MSCI returns show that the fit of his model could improve with time varying betas. Harvey questions the power of the test used by Buckberg although her test accounts for time-varying expected returns (but not betas). Buckberg's test assumes that local market excess returns are proportional to the world market excess returns. A more general test from Harvey (1994) which assumes linearity and allows for time varying betas and expected returns, rejects the single factor ICAPM and the hypothesis that the intercept is equal to zero. The factor used by Harvey (1995) is the world market portfolio represented by the MSCI world market portfolio return in excess of the 1 month Eurodollar deposit rate. The problem with the MSCI world market portfolio as a benchmark portfolio is that it lacks investment in ESMs (less than 2 percent). Therefore, this measure is more appropriate as an industrial world market portfolio while a better benchmark portfolio for this analysis could be the Financial Times Actuaries World Index as proposed by



Buckberg (1996). Harvey also uses an alternative test proposed by Scholes and Williams (1977) which takes into account nonsynchronous trading, but the results do not improve significantly.

Many researchers use multifactor models which include betas for various risk factors [e.g. Claessens, Dasgupta and Glen (1995)]. The problem with using a multifactor CAPM is the assumption that common factors affect different markets, even though this could be incorrect even for integrated markets. Bekaert (1995) examines the degree of integration of 19 ESMs with the US market for the period 1976-1992. Bekaert regresses excess returns on five instrumental variables (two local and three US variables). The predictive power of the US variables as well as the lack of predictive power of the local factors are interpreted as evidence towards market integration. The results do not yield much information about market segmentation although they do indicate a higher degree of integration before 1986 for five countries.

Bekaert also estimates the expected return correlation among developed and ESMs. His results suggest the existence of global factors affecting both developed and ESMs. However, his methodology is based on some strong assumptions which are not likely to hold, thus overestimating the true degree of expected-return correlation. Harvey (1995) adds four more factors in his single factor model - exchange rates, commodity (oil) prices, business cycles and inflation - and although his results get better (but not statistically significant), the model is still unable to explain much of the variation of returns in the countries examined. However, the results from a multifactor model presented in Harvey (1993), suggest that returns in many ESMs are predictable. Claessens, Dasgupta and Glen (1995) examine the cross section of stock returns for nineteen ESMs and find some of the factors examined to be significant. However, in many cases their sign was opposite to the sign found in developed countries.

A model-free way to test for integration is by testing the law of one price [De Santis (1993)], which is a general model underlying all traditional asset pricing models. Differences in the price of the same asset in different countries would reflect lack of integration and could be interpreted as the price of the barriers for each market. De

Santis' findings suggest that it is difficult to derive an asset pricing model for both industrial and ESMs, because factors which are significant for one set of markets are not for the other. However, this result does not imply complete segmentation because there are still some factors which apply to both sets. Integration can also be tested by looking at investment patterns. Most investors prefer domestic assets which shows a lack of integration if investment should be based on the risk and return characteristics of an asset [Tesar and Werner (1995)].

One of the problems of most of the above models is specification with respect to time. Expected returns and betas may vary through time and this issue has been addressed by some researchers [e.g., Bekaert (1995), Buckberg (1995), Harvey (1995)]. Furthermore, the level of integration of ESMs may vary over time. This hypothesis has been tested by Bekaert and Harvey (1995). They find evidence which suggests that integration is indeed time-varying for some countries. However, their results are preliminary in this area since, they use only a single factor asset pricing model.

Tests using additional factors could offer further insights into the issue of markets integration. Their results suggest that contrary to the general perception that markets are becoming increasingly integrated, some markets are actually becoming more segmented. Korajczyk (1995) examines the degree of integration among emerging and developed stock markets using the law of one price to test if ESMs stocks are mispriced. An advantage of his approach is that the variation of the degree of market integration can be measured through time. From the model he develops, it is suggested that most markets experience relatively large misprices at one time or another, due to several factors. These include political instability, foreign investors' intervention, economic reforms (privatisations, liberalisation, etc.), frauds and legal barriers to capital flows. Mispricing often decreases when markets are moving towards greater levels of integration. Related studies, [Demirguc-Kunt and Levine (1995)] find that adjusted mispricing is positively correlated with market volatility and concentration and negatively correlated with market capitalisation and trading volume.



The above results seem to indicate that ESMs are neither integrated nor segmented. The most often cited result support the mild segmentation hypothesis. Furthermore, ESMs are becoming more integrated as they attract more foreign investors. Although the degree of integration has increased, the diversification benefits are still there according to several studies [e.g., Speidell and Sappenfield (1992), Wilcox (1992)]. According to Bekaert (1995), the diversification benefits are not related to market integration or market openness. He argues that policymakers are concerned about the loss of the diversification benefits because of increasing integration, which could result in less investment directed towards ESMs. However, his tests show no correlation between the risk-return trade-off in ESMs and market integration.

Some comments should be made about the above studies. First, the results cited above are based on models which could be misspecified. For example Korajczyk suggests that the differences between his results and Bekaert and Harvey's results may exist because their methods highlight different aspects of the expected returns generating mechanism. In this case, a more well specified model is needed, which will reveal the true level of integration. Also, Errunza and Losq's results indicate that more appropriate tests for mild segmentation should be developed, which will incorporate barriers other than restrictions on capital flows. Finally, tests on indexes could be giving misleading results about the degree of integration of individual markets. Jun (1993), examines the response of individual stocks to liberalisation. Jun finds that the 20 largest Korean stocks' behaviour listed in the IFC index indicates increasing integration with the world market (proxied by the MSCI index returns). The hypothesis examined by Jun, and seems to be accepted by the findings, is that after liberalisation, only the largest stocks which are included in the IFC index will become integrated with the world portfolio. The Korean market as a whole may not become more integrated than before. Actually, since more foreign investors will buy shares in the largest stocks and domestic investors' share will drop, their covariance with the Korean market will fall. Therefore, when examining integration with respect to a whole market and not individual stocks, the results may be misleading and hide the true effects of liberalisation.

Our methodology aims to overcome some - though not all - of the above problems. We examine integration by testing for cointegration among national stock markets. This way we do not run of risk of misspecification like some of the above researchers. By adopting a general approach like cointegration, we can examine integration among national stock markets as well as the nature of the relationship they share. Tests for endogeneity, for example, will tell us which markets react to changes in other market prices and which do not. We also employ a methodology where we examine integration not with respect to stock prices but with respect to risk. This methodology examines the evolution of the riskiness of every country in our sample, during the last decade. Since we estimate the riskiness of each country for each year of the sample period, the test allows us to see how the risk of each country evolved during liberalisation rather than simply accept or reject integration.

Integration among national stock markets has implications for their efficiency and the diversification benefits which drive international investors in these countries. Since we examine integration, we feel that we should also discuss the potential for diversification offered by ESMs and evidence concerning their efficiency.

#### **4.7. Portfolio diversification**

The diversification benefits from investing in ESMs depend on the degree of integration between these markets and developed markets for two reasons: first, low integration implies low covariance with common world factors, which results in low correlated expected returns [Bekaert and Harvey (1995)]; and second, segmentation due to barriers to investment may make potential diversification benefits unattainable for foreign investors [Bekaert (1995)].

There are at least two reasons for fund managers to invest in ESMs: high returns and the diversification benefits - higher returns with lower variance. ESMs are considered from most investors an appropriate vehicle for diversification since most emerging countries' returns are very little or not correlated with developed countries' returns. The issue of



diversification is strongly related to the issue of integration of these markets with the rest of the world's markets.

Harvey (1995) reports very low correlations among ESMs and industrial markets. These results imply that significant diversification benefits are possible if ESMs' equity is included in a world portfolio. The same result can be found elsewhere in the literature [De Santis (1993), Divecha et. al. (1992), Errunza (1983), Errunza and Padmanabhan (1988), Speidell and Sappenfield (1992), Taliente and Fraser (1995), Wilcox (1992)]. These low correlations could be real or could be attributed to certain ESMs' characteristics. Restrictions on equity portfolio flows and poor liquidity can make it difficult for investors to react quickly to changes in the economic environment. Nonsynchronous trading is another potential reason. Also, ESMs' stocks do not necessarily trade every day. Therefore, even when tests are based on low frequency observations, e.g. monthly observations, the prices obtained could be other than the end of month prices or returns could be correlated but with a lag. Mullin (1993) finds that annual correlations are higher than monthly correlations between returns from seven ESMs and developed stock markets. This difference could be attributed to the above factors. Harvey, however, challenges Mullin's results. He argues that the annual correlations, although higher, are not statistically significant. Harvey finds 26 correlation coefficients for ESM returns statistically different from zero with monthly data, but only 5 with annual data. Therefore, he concludes that: "the low correlations are real rather than an artefact of infrequent trading" (p. 25).

Although most tests in the literature find that the correlation between ESMs and developed markets is low, Aitken (1996) argues this does not necessarily mean that diversification benefits are feasible. Aitken argues that most researchers behaviour is backward, because they believed that ESMs could be used as a vehicle for diversification, looking on past performance. Their conclusion is based on historical returns and covariances. As Mullin (1993) demonstrates, the mean/variance frontier obtained from the inclusion of ESM equities in an industrial market portfolio, can vary dramatically depending on the period selected for the analysis. Speidell and Sappenfield (1992) demonstrate this by estimating the risk/return locus for different mixes of S&P's and

EAFE's and different beginning and ending periods. The results differ for each period but the diversification benefits persist in each period.

However, the argument seen in several papers that a 20% holdings of ESMs could increase the efficiency of a portfolio is relying on past performance only and therefore could be misleading [see also Harvey (1993)]. Furthermore, it is not universally accepted whether a 20% holding in ESMs is the optimum investment strategy. Speidell and Sappenfield (1992) take a more conservative position and suggest an optimal ESM weighting of 10 to 15 percent. In Harvey's (1993) analysis, it is not clear whether a 20 percent restriction is useful or not since a higher proportion results in lower returns but with lower volatility. Divecha et. al. (1992) propose a 20 percent investment in ESMs based on a five year holding period.

There are several issues which one should address in the context of global portfolio diversification. How should the currency effect be dealt with in an investment in ESMs? Should diversification strategies be based on countries or industries across countries? Are the diversification benefits attainable or restrictions make them unattainable? Can an investor formulate an ex ante strategy or diversification is possible only with perfect foresight?

#### **4.7.1 Currency effect on diversification**

Currency effect is the effect of currency fluctuation on the diversification benefits from investing in different countries. Errunza and Padmanabhan (1988) find no currency fluctuation effect for ten countries for the period 1976-1980. They examine return correlations of the ten countries with US returns and find no difference in the results obtained when the returns are measured in US dollars or local currency. To determine if there is a currency effect in international investment, several studies have examined the performance of different portfolios with and without currency hedging [e.g. Eaker and Grant (1989), Hauser and Levy (1991)]. These studies conclude that hedging can increase the diversification benefits in developed countries. Similar studies in ESMs are scarce.



Hauser et. al. (1994) find that hedging may be appropriate for ESMs under some conditions. Hedging is appropriate for low-risk investors who dedicate only a small percentage of their portfolio in ESMs (small percentage in this study means a 25% holding in ESMs - a much higher proportion than what is usually held by international investors). If the risk tolerance increases (at about 32% volatility), at 71% expected return, the optimal portfolio should consist of 100% unhedged investment in ESMs. Hedging may not be optimum for ESMs, because the volatility of an investment for a foreign investor depends on the variance of the stock and currency returns and their covariance. The latter is usually negative because many ESMs experience high inflation and high rates of depreciation of their currency. This results in a reduction in volatility, which will be lost if the investor hedges against the foreign currency. Similar results are presented by Johnson et. al. (1993), who find that the covariance between currency returns and local returns is generally considerably greater than and opposite in sign to the currency variance. So, as long as currency volatility contributes to the low correlation of returns between developed and ESMs, hedging for currency risk can actually increase the correlation of returns and reduce the benefits from diversification.

#### **4.7.2 Industry effect on diversification**

This refers to the effect of selecting specific companies or industries in different countries or concentrating on selecting countries only. Divecha et. al. (1992) find a strong country effect in 23 ESMs but no industry effect which means that an investor should focus on selecting countries and not specific stock in these countries because stock returns in each emerging market in the sample are fairly homogenous. Similar results are presented by Errunza and Padmanabhan (1988) who also examine the importance of the country and industry factors in explaining stock returns in 10 countries [see also Errunza (1983) and Grinold et.al. (1989)]. Most countries examined by Divecha et. al. (1992) are fairly well diversified (except for the smaller countries like Jordan and Nigeria). Therefore, high concentration in industries cannot account for the country effect. Hargis and Maloney (1997) however, report very high concentrations in most of the six countries they examine (e.g. about of 88% of Taiwan's market capitalisation is concentrated in manufacturing and financial/insurance/real estate services). Therefore, if the return of a country's stock market depends heavily on the performance of one sector, then this high

concentration could explain the country effect. Another explanation for the country effect could be the high asset concentration (in most markets the 10 biggest companies are a large proportion of the whole market capitalisation). Also factors which drive these markets as a whole (e.g. political events) could cause the country effect.

#### **4.7.3 Diversification benefits using ex ante versus ex post data**

Most studies mentioned so far use ex post data to demonstrate the diversification benefits from investment in ESMs. However, to capitalise on these gains, one would have to have perfect foresight of future correlations. In the long term, it is suggested by De Fusco et. al. (1996) that returns correlation between the US market and three sets of ESMs are not a function of time. De Fusco et. al. use cointegration tests to examine long term correlations among the markets. None of the markets in the three sets are cointegrated so, long term diversification benefits are feasible.

Harvey (1993) examines different ex ante investment strategies and concludes that the inclusion of ESMs in a world portfolio improves performance dramatically. Harvey compares two sets of strategies: one unconditional and one conditional. In each set, there are three types of investment: only developed markets, developed and ESMs with a cap of 20 percent on ESMs proportion and developed and ESMs with no restriction on the proportion. The conditional models which include ESMs equities outperform the alternative strategies.

A different approach to examine the feasibility of ex ante diversification benefits is through the intertemporal stability of the correlation matrix between market returns. Few studies have examined this issue. Cheung and Ho (1991) examined the stability for seven Asian-Pacific ESMs and four developed markets using four different methods. They find that for the period 1977-1988 the return correlation is not stable and it has become more unstable in the most recent years. However, in a later paper, Cheung (1993) uses a non-parametric technique and cannot reject the stability of the correlation matrix. The technique used is the Sen and Puri nonparametric test. It should be noted that this test does not examine the actual covariance between any two markets over time but, the ranking of the covariances. So, although the ranking is stable, the actual covariances may



be unstable. Sinclair et. al. (1994) find that for nine ESMs the correlation matrix is not stable for the period 1977-1992. However, by employing a simple technique they can produce good predictions of the correlation matrix. Their results show no significant differences between ex ante and ex post results.

#### **4.7.4 Attainability of returns**

Although the sizeable diversification benefits from the inclusion of ESMs' equity in a portfolio of developed markets are well documented, Bekaert and Urias (1996) note that most researchers base their analysis on ESMs indexes. Such investment strategy may actually be unattainable due to illiquidity, investment constraints or high transaction costs. Quantifying these problems and assigning a price to them is not feasible. In an attempt to address this problem, Bekaert and Urias examine the diversification benefits from investing in ESMs' closed-end country funds trading in developed markets. There are two problems with this approach: first, the observed returns do not always reflect the performance of the ESM from which the stocks originate, but the composition of the fund (which depends on the ability of the manager to select stocks); and second, closed-end fund shares usually do not trade at their portfolio value (known as net asset value) but at a premium or discount. Therefore, the returns observed deviate from the actual returns in the market from which the fund originates. Bekaert and Urias find that if funds traded in their net asset value, there would be significant diversification benefits if they were included in a US or UK portfolio (the benchmarks used are equally weighted index returns from US and UK country funds). However, because of the differences in portfolio holdings, only UK ESM funds provide statistically significant diversification benefits.

There is another problem associated with country funds: they tend to be correlated with the market in which they trade. Johnson et. al. (1993) examine the behaviour of seven ESM country funds trading in the US market and find that apart from Thailand all other markets are sensitive to the local stock index. The same problem has been addressed by other authors [e.g. Bailey and Lim (1992), Bekaert and Urias (1996)].

The above factors make it more difficult for the investor to benefit from the low correlations reported between developed and ESMs. Direct investment may prove costly

enough to offset any diversification gains (this could be the case in the smallest and less liberalised markets). The problems mentioned above could reduce significantly any diversification gains from country funds. The message to the investor is clear: although diversification benefits may exist, it is not so easy to capitalise on them.

#### **4.7.5. Barriers to entry**

One of reasons why investors cannot reap the diversification benefits offered by ESM is because of barriers to invest in these countries. There are two kinds of barriers: the demand side barriers; i.e. those barriers imposed by the emerging economies, and the supply side barriers; i.e. the barriers which refer to regulations and legislation of the developed markets which prohibits investors to buy into less developed economies.

##### **4.7.5.1 Demand side barriers**

More and more ESMs open up to foreign investors. However, there are still many markets which are either totally or partially closed to foreign investment. There are several ways to restrict investment in a market. Bekaert (1995), distinguishes three groups of barriers: two direct and one indirect. In the first group are legal restrictions applying to foreigners, like, ownership restrictions and taxes. The second group includes barriers about the regulatory and accounting environment like, financial information disclosure from companies and adequacy of settlement systems. The third group refers to country specific risks like, economic policy and political risk. Bekaert identifies as effective barriers, those in the second and third group.

The effect of taxation on dividends and capital gains in ESMs is examined more detailed by Demirguc-Kunt and Huizinga (1992, 1993). They find that taxation has a significant impact on required returns by non-residents. Specifically, taxation is a barrier when imposed on real or inflationary capital gains, but not on dividends. Furthermore, transaction costs are a barrier which declines as a market becomes more developed. The latter result implies that policies should make it easier for foreign investors to enter a market. Demirguc-Kunt and Huizinga also find that it is optimal to take action as early as possible, because the marginal benefits of further development decline as a market becomes more integrated with the world market. In this context, low taxation on foreign



investors could also help market development. However, Newlon (1993) challenges this result in his comments on Demirguc-Kunt and Huizinga's findings. Taxation in the host country is creditable in the home country of the investor, for any dividend gains. But a well diversified investor can also make capital gains creditable in his or her home country. Therefore, as long as taxation is lower in the host country than in the home country -which generally is - than taxes should not matter. Even in the case of tax exempted investors such as pension funds, the results are still suspicious because taxes on dividend gains should be a significant barrier and they are not.

There is a number of additional barriers which made most institutional investors to approach ESMs cautiously. ESMs are very risky and relatively illiquid compared to developed markets. Most debt issues are not graded by a recognised institution so, investors could not evaluate them properly. The few debt issues which are graded, are usually below investment grade and therefore do not meet investment criteria [Chuhan (1994)]. A problem which is common in ESMs is small size of the market and high concentration, factors which result in excessive volatility [Cashin and McDermott (1995), Fischer and Reisen (1994), Taliente and Fraser (1995)]. Other barriers to investment in ESMs are insider trading, the cost of obtaining information and inadequate regulation [Cashin & McDermott (1995), Taliente and Fraser (1995)].

#### **4.7.5.2 Supply side barriers**

There are several other factors which prohibit investment in developing countries. The biggest investors in developed countries are pensions funds and insurance companies. Although capital movement is not restricted in industrial countries, institutional investors face restrictions on their foreign investments. Under UK legislation, life insurers have to match the currency composition of their assets to the currency composition of their liabilities. For liabilities in any currency that account for more than 5 percent of the total, there has to be a matching of assets of at least 80 percent in the same currency. Since most of life insurers' liabilities are in sterling, there is limited scope for foreign investment. In the US, legislation is different from state to state. Under New York State legislation, which is the most influential state on investment issues, only recently the ceiling on foreign investments of life insurance companies was raised from 3 percent to 6

percent. In addition, there is regulation with respect to the quality of investments [Chuhan (1994)]. The above restrictions do not apply to pension funds which can select their investments with more freedom. The requirements for pension funds in most countries are prudence and diversification in order to minimise risk. In Australia, Ireland, Luxembourg, Spain and the UK, there are no legal limits to foreign investment for pension funds [Fischer and Reisen (1994)]. In 1979, when capital controls were dismantled, the foreign asset share of UK pension funds was 7 percent. The same figure for 1985 was 15 percent and for 1994, 30 percent.

#### **4.8. Efficiency in ESMs**

The other issue associated with stock market integration is efficiency. If prices in two stock markets are cointegrated then these stock markets are inefficient in the long run [Chan et. al. (1997)]. Another reason why a discussion of stock market efficiency is necessary is because it is implicated in the relationship between the stock market and economic growth. Efficient stock markets price assets listed on them correctly and allow investors to discriminate between projects in different risk classes. If a stock market is efficient, it has the potential to assist economic growth by diverting funds towards the most productive projects. Efficiency then, has implications for our first question of whether ESMs have assisted the economic development of their countries. The efficient market hypothesis also has implications in the examination of volatility. Efficient stock markets have the ability to price assets correctly and quickly. It is therefore expected that the more efficient the market the lower its volatility since prices will adjust more quickly to news. Also, there is no economic reason why asset prices should fluctuate wildly in the short run. If the stock market can price assets correctly, we should expect these prices to be fairly stable. Efficiency then, has implications in every one of our research question and a discussion on ESM efficiency is required.



Stock market efficiency is one of the most extensively covered areas in the financial literature. Although there are numerous studies about developed markets, few studies have examined informational efficiency in developing countries' markets. Studying the informational efficiency of stock prices is useful because theory suggests that these prices contain information about market expectations of future economic growth and interest rates. Furthermore, movements in equity prices can have direct effects on consumption and investment expenditures via wealth and liquidity effects.

El-Erian and Kumar (1994), argue that although developed equity markets may be efficient, ESMs could be inefficient for a number of reasons: companies divulge far less information to investors compared to that available to investors in industrial countries, the companies are subject to less investment research, small markets are less elaborately organised, markets have difficulty in detecting and discriminating among investment opportunities, capital markets are fragmented, dichotomy exists in the financial activities between organised and unorganised money markets and investors have shorter horizons because of greater political and economic uncertainties. Apart from these reasons, Sharma and Kennedy (1977) further report that in ESMs composition of outputs may respond sluggishly to changes in relative prices and investment preference is given to physical assets rather than financial assets. Additionally, a market experiencing bubbles is inefficient, i.e. prices will not always fully reflect relevant information. It is generally accepted that ESMs are prone to bubbles (there have been several swings in prices which are not justified by fundamentals). Some authors [e.g. Aitken (1996)] support the view that these bubbles indicate the inefficiency of the ESMs.

Given all the above factors, one would expect to find a high degree of inefficiency in ESMs. Few studies have attempted to examine efficiency in the stock markets with respect to macroeconomic variables. Hargis and Maloney (1997) examine prices rationality in six ESMs (three Asian and three Latin American) for the period 1975 to 1993. The study explores whether the indexes in these countries incorporate domestic and global shocks to future expected cash flows as represented by leads of industrial production. The findings suggest that future expected movements in industrial production are incorporated in prices, and the  $R^2$  obtained from these regressions are high. When the

level of US and Japanese industrial production is added in the regression as explanatory variables, the  $R^2$  increases even more for the Asian markets examined but not for the Latin American markets (a possible explanation could be the manufacturing export orientation of the Asian economies). These results indicate efficiency with respect to the forward looking behaviour of the countries examined. A study from Mookerjee (1988) indicates that the Indian stock market is informationally inefficient for the period 1949-1981. Mookerjee conducts Granger causality tests between stock prices and consumption, investment, and real activity as measured by GDP, industrial production and agricultural production. These tests suggest a causal relationship among stock prices and some of the above variables. Similar results are presented by Cornelius (1991) who examines informational efficiency in six ESMs with respect to monetary policy, and Cashin and McDermott (1995), who examine informational efficiency in three ESMs with respect to the equity market price implied by estimated consumption and investment decisions.

There are also a few studies examining efficiency in ESMs in terms of predictability. Before discussing the results a note should be made. In the early literature (pre-Fama, 1970), serial correlation or predictability of returns (either by macroeconomic variables or by anomalies in the returns) would imply inefficiency. However, Fama (1991) argues that all the above could exist in an efficient market. Serial correlation could exist because of nonsynchronous trading, especially for small firms. Also, some markets exhibit positive serial correlation in the short term and negative serial correlation in the long term [see Summers (1986)], but is usually economically insignificant (a further problem is the low power of such tests even for large samples). Such behaviour is consistent with models of irrational pricing as well as time varying expected returns generated by rational pricing [Fama and French (1988)]. Predictability of returns conditional on macroeconomic variables could also imply time varying expected returns. For example, an increase in the dividend yield (which has been used to forecast future returns) could indicate good prospects for a company. In this case, predictability from this variable does not imply inefficiency but forward looking behaviour. On the other hand, if an increase in the dividend yield is not based on forecasts about the future, then it could result in irrational stock price increases which will be temporary. Furthermore, anomalies in returns can be sensitive to the sample examined (as shown by Fama) so, inference should be cautious.



The thing to remember when examining efficiency is that we do not yet fully comprehend how expected returns are affected by their cross section properties and by the real economy. Therefore, extreme caution is needed when making inferences about the efficiency of a stock market. A further problem investors usually face is how to exploit inefficiencies in ESMs. The evidence from the studies for predictability indicate that this is not generally achievable [e.g. Cooper (1982)]. Keane (1993) provides a good discussion on the problems of exploiting inefficiency in ESMs.

The simplest way to test for returns independence is with tests for serial correlation. Such test have been implemented by several authors [e.g. Bekaert (1995), Claessens (1995), Cooper (1982), El Erian and Kumar (1994), Errunza and Losq (1985), Harvey (1993), Richards (1996)]. The results are unanimous: returns in ESMs are more correlated than returns in developed markets, with return autocorrelations statistically different than zero. In some cases the first order autocorrelation reported is higher than 0.2. It is difficult to determine the causes of this predictability. While it could mean inefficiency, it could also be caused by time-varying risk premia [e.g. Claessens et. al. (1995a)]. There are fewer tests on the predictability of long horizons. As Richards (1996) reports, a large sample is needed to ensure that the test for long term predictability does not have low power, which is a problem for ESMs because of data unavailability. Richards uses the approach of Fama and French (1988) to examine autocorrelation up to three years, in a sample of 16 countries. The null of no autocorrelation is rejected in nine cases, in six of which the autocorrelation is negative, indicating price reversals.

Another way to test for returns independence is with a non-parametric test, that is the runs analysis [e.g.. Cooper (1982), El Erian and Kumar (1994), Errunza and Losq (1985), Sharma and Kennedy (1977)]. The runs analysis has a few advantages over the serial correlation test. No assumptions about the distribution of the price changes are needed, it is not affected by unusual price changes which may distort the pattern of price changes and it can detect small periods in the sample where serial correlation is present. Although the runs analysis is superior to the serial correlation test because of the above factors, the results from the two tests have been similar in most cases, again indicating predictability of returns.

A more sophisticated and less frequently seen method to test for randomness, is the spectral analysis [e.g., Cooper (1982), Sharma and Kennedy (1977)]. The spectral analysis examines the autospectrum of the price changes, which should be completely flat if the series is random. If it is not flat, then there are cycles in stock prices. Cooper finds some evidence of nonrandomness based on this test, which generally agree with the results from the previous tests. Sharma and Kennedy fail to find any cyclical behaviour in the Bombay stock exchange.

A robust and simple test of random walk is the variance ratio test [e.g. Aitken (1996), Claessens et. al. (1995)]. This test operates under the hypothesis that if returns follow a random walk, then their variance should increase proportionately with time. The advantage of this approach is that the test focuses on the behaviour of the asset's price and not on the level, which depends on the asset's fundamentals, thus avoiding specification errors. Claessens's results are again similar to the results from their previous tests. Aitken finds that six of 16 ESMs reject the random walk hypothesis for the period 1992-95.

Few studies have examined predictability in ESMs with respect to anomalies (seasonality, day-of-the-week effect). Aggarwal and Rivoli (1989), Claessens et. al., (1995a), and Garrett and Spyrou, (1998), examine seasonality and day-of-the-week effects in four, twenty and ten ESMs respectively for various periods. The results for seasonality vary: Aggarwal and Rivoli find a January effect in three out of the four countries they examine; Claessens et. al. find some evidence of seasonality in their sample, but not a specific turn-of-the-tax-year effect; while Garrett and Spyrou find no evidence of January or other seasonal effect in their sample. The last result is also confirmed by Buckberg (1993) who tested for a January effect in a sample of 20 countries from 1985-1991 and found a significant January effect only for Turkey. Lee (1992), also examines seasonality in five Asian markets (Japan, Korea, Hong Kong, Taiwan and Singapore) for the period 1970 (and 1975) to 1989, and finds a January effect in all of them except Korea. In Hong Kong there is also a December effect. Huang (1997), also finds that returns are higher in January in the Taiwan stock market. The rational behind



seasonality is provided by the “tax-loss-selling” hypothesis which says that investors sell stock which declined in price in order to reduce their taxes. This selling pushes prices down, and once the tax year is over, the stock is bought again and prices return to their equilibrium level, resulting in high returns in January. However, there is no rational explanation for the seasonality in many of these markets, since there are no capital gains taxes.

With respect to the day-of-the-week effect, the results are similar: Aggarwal and Rivoli (1989), Garrett and Spyrou (1998) and Lee et. al. (1990), find lower returns for Monday and higher returns for Friday (Lee et. al. find that the highest returns in his sample are generated first on Wednesdays and then Fridays). These results are similar to findings for industrial countries [e.g. French (1980), Keim and Stambaugh (1984)]. Furthermore, Aggarwal and Rivoli find that the Monday effect is extended on Tuesdays as well. Also, Garrett and Spyrou report a substantial day-of-the-week effect in the Latin American countries of their sample, in general.

Tests on the predictability of returns in ESMs have also been done using lagged information variables [Bekaert (1995), Buckberg (1993), Claessens et. al. (1995), Hargis and Maloney (1997), Harvey (1993)]. These studies have used either local or local and global variables to predict future returns. Claessens et. al. (1995) use local variables to examine the cross section of returns in 19 countries. In eleven countries the “size” variable is significant and positive. This finding contrasts findings in developed markets, where small firms produce higher returns. Turnover is also significant in nine countries with a positive sign. This result indicates that liquidity carries with it a premium which is rather surprising considering that illiquid assets are considered more risky. Both of the above results indicate that investors are attracted to the biggest and more liquid assets in every market, thus increasing the expected return. Other variables with explanatory power in individual countries are price-to-book value and dividend yield but, their sign was not stable so, it is difficult to make inference on the way they affect each market. The  $R^2$  reported vary from 86% for Colombia to -0.02 for Venezuela. In another paper, Claessens et. al. (1995), find no significant size effect in a sample of 20 countries.

Other studies have examined predictability in ESMs using both local and global variables [e.g., Bekaert (1995), Buckberg (1993), Hargis and Maloney (1997), Harvey (1995)]. The variables used in these studies are lagged local and global returns, dividend yields and interest rates, with some exceptions. Two issues are examined: first, the predictability of returns in these markets, and second, which set of variables drive the markets: local or global. The results obtained from these studies vary. Buckberg's sample consists of 20 countries and the period examined is from 1985 to 1991. The fit of the instruments in the regressions ranges from 0.338 for Colombia to negative values. Buckberg finds that compared to developed markets, ESMs are more predictable. Another finding is that predictability in several countries is driven by the lagged local return.

This finding contradicts Bekaert's results for 19 countries for the period 1985-1992, who finds that it is the local lagged dividend yield and not the local return which drives predictability in a number of countries [see also Hargis and Maloney (1997)]. His findings are consistent with results from developed countries as well [e.g., Bekaert and Hodrick (1992)]. Bekaert finds that predictability in ESMs is generally driven by the local variables and is not significant for the period examined. However, for an earlier period (1976-1985) predictability in the same markets is much stronger and it derives mainly from global instruments.

Harvey examines predictability in 20 ESMs from 1976 to 1992. He finds that predictability has actually increased recently and that predictability in returns is driven by local factors. His results are confirmed by Hargis and Maloney (1997) who examine 6 ESMs for the period 1975 to 1993. Harvey takes the analysis one step further and examines how these predictions can help ex ante in the formation of a portfolio where predictions given by his model are used as expected returns. The results indicate that the portfolios based on conditioning information can lead to consistent higher returns compared to the unconditional strategy. The results from the above studies seem to agree that ESMs are more predictable than developed markets and this predictability is economically significant for investment decision.

#### **4.9. Summary and Conclusions**



In this chapter, we have tried to give an account of the status, role and characteristics of ESMs in the global market and to review the empirical evidence concerning our research questions. The ESMs were given increased attention both by investors and academics the last two decades when governments used them in an attempt to attract foreign capital in their countries. This coincided with a decrease in the rate of return offered by developed stock markets in the early 1990s because of an economic slowdown. Although ESMs are a great deal riskier than developed ones, investors noticed that these markets exhibit some desirable characteristics. One is high returns. If an investor could foresee when to enter and exit a market, he could realise returns a lot higher than any developed stock market usually offered. Second, ESMs offer valuable diversification benefits for the global investor. Most developing economies tend to move together overtime but emerging economies do not follow that trend. Therefore, a global investor can minimise her risk by investing a portion of her funds in ESMs. Because of these reasons, foreign investors have invested heavily in ESMs during the last twenty years. However, it is frequently said in the literature that the investors behaviour is erratic and “herd-like”. This behaviour is claimed to have caused crashes, like the Mexican crash in 1994. What is worse, is that there is evidence suggesting that once a national stock market crashes, the whole geographic area surrounding this country is affected. So, after the Mexican crash, several South American stock markets fell for no apparent reason. This fall could not be justified based on fundamentals and was blamed on the erratic behaviour of the investors.

Apart from the desirable characteristics found in ESMs, foreign investors also found several undesirable ones. In many ESMs there are restrictions on capital flows or available investments to foreigners. Foreign investors also complain about other problems such as insider trading and inadequate regulation of these markets. In terms of assessing a market, there are difficulties as well. Studies have found that most ESMs are not efficient in pricing stocks. Prices most often than not are not based on fundamentals. Furthermore, most of these market are a lot more volatile than developed markets. While this last characteristic presents opportunities for short term profits, it makes most investors nervous about their investment, resulting in capital flight when trouble arises.

From the above, it seems that most emerging stock markets are inefficient and ridden with problems. Such characteristics have serious implications on the questions we have posed. The following chapters examine empirically whether the development of the stock market contributed to economic growth, if stock price volatility increased following liberalisation and if the ESMs became integrated following liberalisation. The characteristics of the stock markets in these regions and the nature of foreign investment there, should be considered when we discuss the results from our tests. It seems implausible to expect to find a positive effect between stock market development and growth in countries where the stock market resembles a casino and extreme volatility in prices is the norm. Also, if foreign investors used these markets purely for speculation, we should expect a large increase in the volatility of these markets and segmentation after foreign investors were allowed to invest there.

It should be noted however, that not all countries present the above characteristics. Some of the countries in our sample have shown economic stability and a soundness of macroeconomic policies which are considered good even by developed countries standards. Our results will have to be considered vis-à-vis the special characteristics of each emerging economy, which were presented in chapter 2 where we provided an overview of the economic development of some of the countries examined, during the last two decades. We shall now discuss the methodologies that we employ to test our hypotheses.



## **CHAPTER 5: DATA AND TESTING METHODOLOGIES**

### **5.1. Introduction**

In the previous chapter we reviewed the empirical research on the issues we examined. We found that there are certain gaps in the literature which we shall attempt to fill. One of the problems with the existing literature involves the methodologies followed by several researchers. We believe that our methodologies overcome several of the problems discussed in the previous chapter. In this chapter we present the methodologies we shall follow, explain why we use them and discuss the data used in the analyses.

### **5.2. Methodology and data for the first research question**

#### **5.2.1. Testing methodology**

The first research question is how the stock market and banking sector interact in the developing economies and if they assisted their economic development. Our concern is the time series analysis of the variables of interest (i.e. the proxies for the stock market development and volatility, the banking sector development and the real economy). We wish to examine the long run relationship among the four variables and how they interact in a system. Although we do not examine the short run dynamics, we need to utilise a methodology which accounts for these dynamics and provides results concerning the long run only. We feel that the most appropriate methodology is to test for cointegration among the variables. This methodology will give us an insight into the relationship of each of the variables with the others and how they behave as a system. In the present analysis this methodology is particularly relevant because we wish to establish not only how these variables relate, but also which of the variables are endogenous. Endogeneity of the relevant variables is a basic assumption of the Boyd and Smith (1996) model because the financial sector development causes economic growth and vice versa. In the present analysis, we use the Johansen cointegration methodology which involves several steps described below.

### 5.2.1.1 Stationarity

The first step in the analysis is to test for stationarity. A process is said to be stationary if its mean and variance are independent of time. In this case, a time series  $(x_t)$  mean  $E(x_t)$  and variance  $E[x_t - E(x_t)]^2$  will be stable for any subperiod of the sample period. Instead, if a series  $(x_t)$  is non-stationary then, its mean and variance will change over time. This has both economic and statistical implications. If a series is non-stationary the effect of any shock in the series is permanent. Establishing stationarity is important in econometrics because unless the variables involved in a model are all of the same order of integration, then the result could be a spurious regression.

If non-stationary series are differenced one or more times they usually become stationary. Depending on how many times we have to difference a series we refer to the series order of integration. If we have to difference a series once to make it stationary then this series is said to be of first order. Notationally we use the symbol  $I(d)$ , where  $d$  is the order of integration. Thus, the notation for a first order series is  $I(1)$ . Most economic series are  $I(1)$ . To determine the order of a series the most common test is the Dickey-Fuller tests (DF) proposed by D. Dickey and W. Fuller (1979, 1981). The simplest form of the DF tests amounts to estimating:

$$x_t = \rho x_{t-1} + u_t, \quad (1)$$

and testing whether  $\rho$  equals to 1. Alternatively we test whether  $\rho^* = \rho - 1 = 0$  against  $\rho^* < 0$ . This alternative test simplifies matters if a more complicated autoregressive process is considered [Harris (1995)]. Equation (1) assumes that the data generating process is a simple first order autoregressive process with no trend component, zero mean and that the first observation is also zero. Since these assumptions hardly satisfy any empirical series, the test most commonly used is:

$$\Delta x_t = \alpha + \beta t + \rho^* x_{t-1} + u_t, \quad (2)$$



where  $t$  is the time trend. Equation (2) assumes that the series follows a first order autoregressive process. If this is not true, the residuals  $u_t$  will be autocorrelated and the DF test will be invalidated because the DF distributions are based on the assumption that the residual is white noise. For this reason the test should have sufficient lags to ensure that the residuals are not correlated. This results in the augmented DF test. In the presence of unit roots, the estimates of the autoregressive parameters have a non-standard distribution and the critical values for the usual tests ( $t$ ,  $F$ ) cannot be used. Instead, we use the distributions tabulated by Dickey and Fuller. The critical values for their distributions have been computed using Monte Carlo techniques and are much larger than those in the  $F$  table. The null hypothesis is the existence of a unit root which implies nonstationarity. If the null is rejected (i.e. if the  $F$  test is larger than the critical value) then there is no unit root and the process is stationary.

#### 5.2.1.2 Cointegration

The notion of cointegration refers to the case where two or more variables move together over time and the difference between them is stable over time. Consider two variables  $x_t$  and  $y_t$ , where  $x_t$  is  $I(1)$  and  $y_t$  is  $I(0)$ . Then any linear combination of these variables will be  $I(1)$ . Regressions where variables of different orders of integration are involved can often lead to spurious results. Consider now two variables  $x_t$  and  $y_t$  where they are both  $I(1)$ . Generally, linear combinations of these two variables will be also  $I(1)$ . However, there are cases where linear combinations of two or more variables of the same order of integration are of a lower order of integration. For example, if  $x_t$  and  $y_t$  are both  $I(1)$  and  $z_t = y_t - \alpha - \beta x_t$  is  $I(0)$ , then  $x_t$  and  $y_t$  are said to be cointegrated of order  $CI(1,1)$  [Engle and Granger (1987)].

One of the most important implications of cointegration is the Granger representation theorem (Granger 1983, Engle and Granger, 1987). The theorem states that if two or more variables are cointegrated of order 1, then the data can be represented by error correction models. These models for two variables  $x_t$  and  $y_t$  are:

$$\Delta x_t = \alpha_1 + \beta z_t + \text{lags}(\Delta x_t, y_t) + u_{xt}, \quad (3)$$

$$\Delta y_t = \alpha_2 + \beta z_t + \text{lags}(\Delta y_t, x_t) + u_{yt}, \quad (4)$$

where  $(u_{xt}, u_{yt})$  is bivariate white noise and at least one of  $\beta_1$  and  $\beta_2$  is non-zero. If  $x_t$  and  $y_t$  are cointegrated then  $z_t$  is  $I(0)$  and each one of the two equations is  $I(0)$ . If this is the case, then the two variables move closely together over time. There are two methodologies to test for cointegration: the Engle and Granger (1987) methodology and the Johansen (1988) methodology. The latter has several advantages over the Engle and Granger methodology, of which the main is that it can estimate the number of cointegrating vectors in the system. Therefore, for the present analysis we utilise the Johansen methodology.

### 5.2.1.3 The Johansen methodology

The Johansen (1988) methodology is rather complicated and by now well known in the academic literature so, here we give only a brief overview of it. It begins with the construction of a multivariate autoregressive model of the form:

$$z_t = A_1 z_{t-1} + A_2 z_{t-2} + \dots + A_k z_{t-k} + u_t, \quad u_t \sim \text{IN}(0, \Sigma) \quad (5)$$

where  $z_t$  is a  $(n \times 1)$  matrix of  $n$  potentially endogenous variables and each of the  $A_i$  is a  $(n \times n)$  matrix of parameters. Equation (3) can be reformulated into a vector error-correction form:

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + \dots + \Gamma_{k-1} \Delta z_{t-k+1} + \Pi z_{t-k} + u_t, \quad u_t \sim \text{IN}(0, \Sigma) \quad (6)$$

where  $\Gamma_i = -(I - A_1 - \dots - A_i)$ ,  $(i = 1, \dots, k-1)$  and  $\Pi = -(I - A_1 - \dots - A_k)$ , with  $I$  being the identity matrix. The vector error correction form gives us information about the short and the long run via the estimates of  $\Gamma_i$  and  $\Pi$  respectively. It can be shown that  $\Pi = \alpha\beta'$ , where  $\alpha$  is the speed of adjustment to disequilibrium and  $\beta$  is a vector of long run coefficients. Johansen proposes to regress  $\Delta z_t$  and  $z_{t-k}$  on a constant and the  $z_t$  lagged differences to obtain the residual vectors  $R_{0t}$  and  $R_{kt}$  respectively. These residual vectors are then used to form residual matrices:



$$S_{ij} = T^{-1} \sum_{t=1}^T R_{it} R_{jt}' \quad i, j = 0, k \quad (7)$$

The eigenvectors which correspond to the  $r$  largest eigenvalues from solving the equation

$$\left| \lambda S_{kk} - S_{k0} S_{00}^{-1} S_{0k} \right| = 0 \quad (8)$$

are the maximum likelihood estimate of  $\beta$ . This procedure gives  $n$  eigenvalues  $\hat{\lambda}_1 > \hat{\lambda}_2 > \dots > \hat{\lambda}_n$  and the corresponding eigenvectors  $\hat{V} = (\hat{v}_1, \dots, \hat{v}_n)$ . The  $r$  elements in  $\hat{V}$  are the cointegrating vectors. Furthermore, Johansen shows that  $\hat{\alpha} = S_{0k} \hat{\beta}$  from which we obtain estimates of  $\alpha$ . Once we have estimates of  $\alpha$  and  $\beta$  and test for restrictions, we then estimate equation (4) by OLS to obtain the full model.

#### 5.2.1.4 Constructing the long run equations

To choose the appropriate lag length, cointegration rank and the model for deterministic components we use *Microfit 4.0*. First, we run the VAR model for several different lag lengths and choose the appropriate lag length according to the log-likelihood ratio statistic. We run specification tests on the model with the chosen lag length. If the model suffers from any problems, we use a higher order model. We then run tests for cointegration using different specifications with regards to deterministic components. If we find cointegration under different specifications, we determine rank and model specification simultaneously using the Pantula principle [Harris (1995)]. We estimate three models: one with restricted intercepts and no trends (Model 1), one with unrestricted intercepts and no trends (Model 2) and one with unrestricted intercepts and restricted trends (Model 3). We then compare the trace and max-eigenvalue statistics with their critical values starting from Model 1 through to Model 3 for each different rank. We stop the first time the null hypothesis is not rejected and we choose the Model for which the null hypothesis was not rejected and the appropriate rank (the results are presented and explained more clearly in appendix 3). When the two tests (trace and max-eigenvalue) do not choose the same model, we choose the one proposed by the trace statistic because it is more robust to both skewness and kurtosis in the residuals than the max-eigenvalue statistic [Harris (1995)].

In order to construct the long run equations, once we determine the number of cointegrating vectors in our models we run restrictions to obtain the most parsimonious specification not rejected by the data [see: Arestis and Demetriades (1997)]. We begin by testing for weak exogeneity of each variable to the system. These test are distributed as  $\chi^2(1)$  (except from Chile where we find two cointegrating vectors and the tests are distributed as  $\chi^2(2)$ ). Once we establish which variables are exogenous to the system, we impose the restriction in further estimation. The next step is to find which variables in the cointegrating vector(s) are significant. These tests are carried out sequentially and when the tests do not reject the null, the variable is dropped from the estimation. Finally, in order to establish which of the variables is endogenous to which vector, we run the error correction regressions and examine the significance of each of the error correction model in each regression using the t-ratio. For the countries where only one cointegration vector was found, the error correction regressions are run to verify the endogeneity tests for the reduced cointegration vector. Once we establish the endogeneity of a variable to a vector, the vector is then normalised on this variable and presented in equation form.

### **5.2.2. Data**

To examine the relationship between economic development and the financial sector in emerging economies, we utilise data from five countries: Chile, India, Mexico, South Korea and Taiwan. We chose these particular countries because they followed different paths to economic liberalisation and their stock markets exhibit different characteristics. Therefore, the results should also provide evidence for and against liberalisation policies adopted by emerging countries. Ideally, we should include more countries in our analysis, but data unavailability is a major constraint.

During the past two decades, Chile opened up its stock market to foreign investors and adopted a monetarist approach for its economic policy. Although, foreigners were allowed to invest in the country, capital repatriation was restricted. This policy gained much praise from economists during the 1997 crash because it insulated the country from sudden massive capital outflows which other countries experienced. One effect of this policy was a more stable stock market compared to other developing countries. India's



economy has been centrally controlled since it gained independence in 1947. This has put a strain on the country's economic growth, which economists call 'the Hindu rate of growth'. The interest in this case is to examine the effect of the stock market on a mainly state controlled economy. Mexico followed the US economic model and liberalised its economy rapidly during the '1980s. The Mexican stock market grew at a very fast rate mainly because of foreign investors. This rapid growth came to a halt in 1994 when the stock market crashed. Since then, it made an impressive recovery in a relatively short period of time. South Korea was until recently considered a 'miracle' economy by economists world-wide. Its successful heavy industry was part of a government development plan. The development of the stock market was also part of a government plan. The role of the stock market in South Korea was to mobilise savings outside banks (because of rising interest rates) and to diffuse the country wealth from the few chaebol bosses to shareholders. The government took a series of measures (e.g. restrictions on foreign borrowing, debt-equity ceilings) to force the chaebol to raise money from the stock market. Another interesting feature of the South Korean stock market is that the government launched a stock market stabilisation fund: a fund which the government used to buy shares when prices fell and sell shares when prices rose 'excessively'. Under these conditions, the stock market was not allowed to be excessively volatile - so, the Keynesian argument against the development of stock markets cannot apply in this case - but it could not perform its primary function as a pricing mechanism. It is therefore interesting to examine what effect a government controlled stock market had on the South Korean economy. Finally, the Taiwanese stock market has been one of the most volatile during the late 1980s and 1990s. The government had imposed restrictions on capital inflows and outflows so, the only investment outlets for the Taiwanese were the stock market and the real estate sector. The Taiwanese people became rather wealthy during the last two decades due to the country's vast exports. A lot of their money found their way into the stock market pushing prices up. This gave the Taiwanese stock market the reputation of a casino.

The different liberalisation paths followed by these countries and the different role given to the stock market in their respective economies make an interesting case study. Here, not only do we examine the relationship between stock market and banks and their effect

on the real economy, but we also attempt to find evidence on the usefulness of a stock market under different economic regimes.

The data we use in the present analysis serve as proxies for the three variables under investigation, namely: stock market development, banking sector and economic growth. To proxy economic growth, most studies on developing economies use the GDP indicator. However, for most developing countries, this variable is available only annually and in some cases the series are discontinued. Considering that we examine a period of about twenty years, annual data would give us too few observations for cointegration analysis. Therefore, we use the industrial production index as a proxy for economic growth, as in Chatrath et. al. (1997). The industrial production index should be a good proxy for real economic activity because it includes manufacturing, mining, construction and public goods production, which compose the major part of an economy, especially for Asian countries which are manufacturing oriented. For the banking sector, we use the amount of credit given by both public and private banks to the private sector, because in these countries the state usually provided loans to businesses. For Taiwan, we use the M2 measure of money supply. One of the characteristics of the Taiwanese economy is the huge black economy. Therefore, we feel that the official credit given to enterprises will not be an accurate measure of the total credit given to them. A measure of the amount of money circulating in the economy would be more appropriate as a proxy of the size of the official and unofficial credit market. For the stock market development proxy, we use the stock market capitalisation. Demirguc-Kunt and Levine (1995) examine various measures of stock market development. In their paper they construct indices of stock market development using various indicators. Then, they compare the individual measures of stock market development to the indices and find that both the indices and stock market capitalisation divided by GDP give similar results with respect to which markets are developed or underdeveloped. Therefore, we feel that stock market capitalisation is a good measure for stock market development even when used on each own<sup>1</sup>. This measure is directly related to size which is positively correlated with the ability to mobilise capital and diversify risk.

---

<sup>1</sup> Having said that, we recognise that different measures of stock market development could give a better understanding on the effect of stock market development on the economy. Using different measures is



Additionally we use a measure of stock market volatility similar to the one used by Arestis and Demetriades (1997). This volatility variable is the 12 month rolling standard deviation of the stock market indexes' logarithmic returns<sup>2</sup>. Demirguc-Kunt and Levine (1995), refer to "less volatility" as a measure of stock market development, although they recognise that this is not necessarily the case [see: Lamoureux and Lastrapes (1990a)]. In the present study, we are more interested in the status of the volatility measure in the models. If the volatility measure is endogenous, this provides evidence for the Boyd and Smith model, while if it is exogenous and negatively related to economic growth, it provides evidence for the Keynesian economists.

The banking sector measures and the stock market capitalisation are deflated by the consumer prices index<sup>3</sup>. The industrial production index is deflated by construction<sup>4</sup>. All data are monthly and can be obtained from the on-line information system Datastream International, except for the Taiwanese market capitalisation which is obtained from the Monthly Bulletin of Statistics of China. All variables are expressed in logarithms. The sample period for each country differs according to data availability. The start of the sample period is January 1977 for India, Mexico and Taiwan; January 1976 for South Korea and January 1982 for Chile because this is the earliest periods that we could find data for these countries. The end of the sample period is November 1997 for all countries because we want to exclude the period after the South East Asia crisis. Inclusion of this period would probably distort our estimators and introduce structural breaks in our regressions. Because of severe serial correlation in the data<sup>5</sup>, we seasonally adjust them using the ratio to moving average technique (appendix 1). The only series which did not exhibit any seasonal trends were market capitalisation for Chile and South Korea and the industrial production index for South Korea. These series were left unadjusted.

---

particularly useful when one examines the channels through which stock market development affects the economy [see Levine and Zervos (1998)].

<sup>2</sup> For a discussion on the limitations of volatility measures, see: Pagan (1986).

<sup>3</sup> We prefer the CPI to the WPI because the former includes goods *and* services and is therefore more appropriate as a deflator. Other 'more appropriate' deflators are not available for these countries.

<sup>4</sup> See, IMF International Financial Statistics.

<sup>5</sup> When we ran the VAR models to determine the lag length for each country, serial correlation was present even after we added 18 lags.

### 5.3. Methodology and data for the second research question

#### 5.3.1 Testing methodology

The second research question is if stock market volatility increased following the opening of the ESMs to foreign investors and we examine changes in volatility using two procedures. The first methodology we employ in our analysis is the examination of volatility with a GARCH process. The second procedure utilises an EGARCH process and estimates the news impact curves for each country and subperiod. The reason we use two different tests to examine volatility is because they can both give useful information about changes in the nature of volatility. Bollerslev et. al. (1992) states that most stock return data follow a GARCH process of low order. However, the GARCH process cannot account for asymmetries in volatility, which have been found to be present in stock return data [e.g. Christie (1982)]. For this reason we also use an EGARCH process and examine the asymmetry graphically using a procedure proposed by Engle and Ng (1993).

As a first step in the analysis, we test for ARCH effects in the data. The autoregressive conditional heteroscedasticity (ARCH) model developed by Engle (1982) can account for the difference between the unconditional and the conditional variance of a stochastic process. ARCH modelling in finance has proven to be a very useful means of empirically examining the momentum in conditional variance. While conventional econometric models operate under the assumption of constant variance, the ARCH process allows the conditional variance to vary over time, leaving the unconditional variance constant. In the ARCH(q) model the conditional variance is a function of past squared innovations ( $u_t$ ) in the mean of some other stochastic process, thus allowing it to change over time. Equations (9)-(11) describe an ARCH(q) process:

$$y_t = \beta' x_t + u_t \quad (9)$$

$$u_t | \Omega_{t-1} \sim N(0, h_t) \quad (10)$$

$$h_t^2 = \omega + \sum_{i=1}^q a_i u_{t-i}^2 \quad (11)$$



where  $x_t$  is a vector including the information set  $\Omega_{t-1}$ ,  $u_t$  is a random error, and  $h_t^2$  is the conditional volatility of the stochastic process  $y_t$ .

The main critique against ARCH modelling is that it lacks theoretical justification. Several interpretations of the ARCH effect can be found in the literature, none however has been fully satisfactory. Diebold and Nerlove (1989) argue that the ARCH effect is attributed to a serially correlated news arrival process. A similar explanation is given by Lamoureux and Lastrapes (1990a), who argue that volatility clustering can be explained by trading volume. If the news arrival process is serially correlated, then trading volume and volatility should be contemporaneous related [Tauchen and Pitts (1983)]. Some support to the serially correlated news arrival process has been given by Engle, Ito and Lin (1990). Further support to this argument is given by Bodurtha and Mark (1990) and Attanasio (1991), who find evidence of an ARCH(3) process in their analysis of portfolios of monthly NYSE stock returns and monthly excess returns on the S&P500 index, respectively. It is likely that the ARCH effect is present on a quarterly basis simply because of the way firms announce dividends and earnings. Other researchers attribute the ARCH effect to macroeconomic variables. Such variables include the nominal interest rates [Glosten, Jagannathan and Runkle (1991)], the dividend yield [Attanasio (1991)] and the M1 money supply [Engel and Rodrigues (1989)]. Other possible explanations for the ARCH effect are the business cycle [Schwert (1989)] and the changes in the margin requirements [Hardouvelis (1990)].

From an econometric perspective, a problem with the ARCH specification is that it requires a relatively long lag structure in the conditional variance equation to take account of the long memory typically found in empirical work. However, a long lag often results in violation of the non-negativity constraints imposed on the ARCH parameters to ensure a positive variance. A more general process with a longer memory is the Generalised ARCH (GARCH) process developed by Bollerslev (1986). The GARCH models are capable of capturing leptocurtosis, skewness and volatility clustering, which are the three features most often observed in empirical analysis. Evidence of non-normality in market returns have been documented by several researchers [e.g. Harvey

(1995), Bekaert and Harvey (1997)] and will be examined in the current analysis as well. Volatility clustering implies that large (small) price changes follow large (small) price changes of either sign. While volatility clustering has also been documented in high frequency data, it is not clear what causes this clustering although some interpretation has been given in the literature [Lamoureux and Lastrapes (1990a)]. In the GARCH(q,p) model, the conditional volatility is specified as in (11) with the addition of its past squared values, as in equation (12):

$$h_t^2 = \omega + \sum_{i=1}^q a_i u_{t-i}^2 + \sum_{i=1}^p c_i h_{t-i}^2 \quad (12)$$

For a well defined GARCH(q,p) the following restrictions must be imposed to ensure that the conditional variance does not take negative values:  $\omega > 0$ ,  $a_i \geq 0$  and  $c_i \geq 0$ . One of the appealing features of the GARCH model, is that it can be interpreted as an ARMA model. Assuming  $q \geq p$  (without loss of generality) and rearranging the terms of equation (12) we get:

$$u_t^2 = \omega + \sum_{i=1}^q (a_i + c_i) u_{t-i}^2 - \sum_{i=1}^p c_i (u_{t-i}^2 - h_{t-i}^2) + (u_t^2 - h_t^2) \quad (13)$$

Equation (13) is an ARMA process with serially uncorrelated innovations  $(u_t^2 - h_t^2)$ . Although the innovations of the process is not correlated, it is heteroscedastic, so that estimation using standard Box-Jenkins procedure is inefficient. However, the formulas for forecasting ARMA processes still apply and the familiar ARMA processes theory can be applied to address questions on unit roots for long term forecasting [Engle and Bollerslev (1986)]. Interpreting the GARCH model as an ARMA process can also be used to identify the order of q and p [Bollerslev (1988)].

GARCH models are well known in the literature. By now, several studies have applied GARCH modelling on financial data to test several hypotheses; e.g. Choudhry (1996) examines volatility before and after the October 1987 crash in six emerging markets, Engle and Ng (1993), use and compare several GARCH models to examine the impact of



news on volatility, Fraser and Power (1997), examine the relationship between conditional volatility and market performance and news arrival in seven markets. Bollerslev et al (1992) review the empirical evidence on the ARCH modelling in finance and report developments in the family of GARCH modelling. In their review they find that most financial series follow a GARCH(1,1) process. In the present analysis, we will test for higher order GARCH processes as well. Selection of the appropriate order will be made by means of the log likelihood function of each equation. The models with the highest values for each period will be selected.

The mean equation for the stock returns assumes an AR(1) process and is given by (14)

$$y_t = \beta_0 + \beta_1 y_{t-1} + u_t \quad (14)$$

where  $y_t$  is the return at time  $t$ , and  $u_t$  is the error term. To capture the time varying volatility, equation (12) is used. The coefficient of the squared error term ( $a$ ) measures the extent to which past news cause volatility today. In other words the size and significance of  $a$  implies the existence of volatility clustering in the data. The sum ( $a+c$ ) measures volatility persistence. As the sum  $a+c$  approaches unity, the persistence of shocks to volatility becomes greater. If  $a+c=1$  then any shock to volatility is permanent and the unconditional variance is infinite. In this case, the process is called an I-GARCH process [integrated in variance process, Engle and Bollerslev (1986)]. The I-GARCH process implies that volatility persistence is permanent and therefore past volatility is significant in predicting future volatility over all finite horizons. If the sum  $a+c$  is greater than unity, then volatility is explosive; i.e. a shock to volatility this period will result in even greater volatility during the next period [Chou (1988)].

In estimating the GARCH parameters pre- and post-liberalisation we have to make an assumption about the distribution of returns. Because of the non-normality of the unpredictable returns, assuming a normal distribution for the GARCH models could be inappropriate and result in inaccurate estimates [although in most cases results obtained under both assumptions are similar, e.g. Choudhry (1996)]. Therefore, all models are

estimated assuming a normal distribution and alternatively a  $t$  distribution. Selection between the two models is based on the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC).

Before estimating the GARCH models for the two subperiods, it is be useful to test for structural shifts in the variance of the data examined. In small samples, the absence of structural shifts could account for low GARCH values [Diebold (1986)]. Structural shifts mean that the constant in the variance equation of the GARCH model is not stable over time; i.e. the unconditional variance is non-stationary. Lamoureux and Lastrapes (1990b) examine structural shifts in the variance of daily returns from 30 companies and discuss the implications such shifts have for the results given by the standard GARCH model. Over long sample periods, it is likely that structural shifts will occur. These result in overestimation of the GARCH parameters, which could suggest an I-GARCH process. Volatility persistence has serious implications for issues such as option pricing and risk premia analysis, thus, unbiased estimates of the GARCH parameters are essential. Lastrapes (1989), confirms the appearance of this problem in big samples. Lastrapes examines exchange rate volatility and finds that, when US monetary policy regime changes are accounted for by dummy variables in the GARCH model used, volatility persistence is significantly reduced. Lamoureux and Lastrapes (1990b) findings suggest that discrete, infrequent shifts in unconditional variance are a type of persistence in variance. This type of variance contains no information about future variance contrary to a GARCH process which contains information about the future. Although the problem that structural shifts impose has been empirically confirmed, it has not been addressed in economic contexts. Another problem of accounting for structural shifts is that there is no methodology identifying the timing of such discrete shifts. In the present analysis only one subperiod can be identified *a priori*, the October 1997 crash. In October 1997, South Asian stock markets suffered a crash from which some countries still have not recovered. The turbulence in these markets can be seen in Figures 7.7-7.14, presented at the end of chapter 7. Towards the end of the period, adjusted returns for some of the Asian countries seem more volatile than the rest of the period. Therefore, we test for a structural shift from the beginning of September 1997 (to allow for the possibility of increased volatility prior to the crash due to anticipation of what actually happened), until the end of the



sample period. Although the crash affected Asian stock markets, tests are conducted for the same period for the Latin American countries as well because there is the possibility of volatility spillovers.

To test for structural shifts in the unconditional variance, we include dummy variables in the variance equation of the standard GARCH model, as in (15):

$$h_t^2 = \omega + d D_t + a u_{t-1}^2 + c h_{t-1}^2 \quad (15)$$

where  $D_t$  is a dummy variable which corresponds to the period September 1997 to February 1998, i.e. takes the value of 1 for this period and 0 otherwise. We also test for structural shifts in the mean equation, by running the mean equation (14) with the addition of a dummy variable. If the dummy variable in any of the equations is significant, then the constant in the variance or the mean equation is not stable and the period for which it is unstable should be dropped from the analysis. The period used is the post-liberalisation period for every country. Then we proceed with the analysis as described above.

The second methodology we use, is the examination of the changes of the impact of news on volatility using an exponential GARCH (EGARCH) process. To compare volatility before and after liberalisation, we use the news impact curves suggested by the EGARCH process proposed by Nelson (1991). The variance equation of the EGARCH model is:

$$\log(h_t) = \omega + \beta \log(h_{t-1}) + \gamma \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + \alpha \left[ \frac{|\varepsilon_{t-1}|}{\sqrt{h_{t-1}}} - \sqrt{\frac{2}{\pi}} \right] \quad (16)$$

where,  $\varepsilon_{t-1}$  are the residuals from the mean equation. The news impact curves which is proposed by Engle and Ng (1993) relate  $\varepsilon_{t-1}$  to  $h_t$ , so past return shocks are related to current volatility. We use the EGARCH model because it can capture asymmetries in the volatility of stock returns. Black (1976) and Christie (1982) have found that volatility

increases with 'bad news' and falls with 'good news'<sup>6</sup>. Other models (e.g. GARCH) are not able to capture this effect since they do not discriminate between positive and negative unexpected returns. The other desirable feature of the EGARCH model, is that the parameters of the model do not need to be restricted to ensure that the process remains positive.

The news impact curves measure how volatility is generated from unexpected returns. For the EGARCH model, the curve is centred at  $\varepsilon_{t-1} = 0$  and is increasing exponentially but with different parameters for positive and negative values of the residuals. The news impact curve is given by<sup>7</sup>:

$$h_t = A \exp \left[ \frac{(\gamma + \alpha)}{\sigma} \varepsilon_{t-1} - 1 \right], \text{ for } \varepsilon_{t-1} > 0, \text{ and} \quad (17)$$

$$h_t = A \exp \left[ \frac{(\gamma - \alpha)}{\sigma} \varepsilon_{t-1} - 1 \right], \text{ for } \varepsilon_{t-1} < 0, \quad (18)$$

where  $A = \sigma^{2\beta} \exp[\omega - \alpha \sqrt{2/\pi}]$  and  $\sigma$  is the unconditional return standard deviation implied by the conditional variance equation.

The unconditional return variance is given by<sup>8</sup>:

$$\sigma^2 = \exp \left[ \frac{\omega - \alpha \sqrt{\frac{2}{\pi}}}{1 - \beta} + \frac{1}{2} \frac{(\gamma^2 + \alpha^2)}{1 - \beta^2} \right] \times \prod_{m=0}^{\infty} [F_m(\beta, \gamma, \alpha) + F_m(\beta, -\gamma, \alpha)], \quad (19)$$

where  $F_m(\beta, \gamma, \alpha) = N[\beta^m(\alpha + \gamma)] \exp[\beta^{2m} \gamma \alpha]$ , and  $N(\alpha) = \left( \frac{1}{\sqrt{2\pi}} \right) \int_{-\infty}^{\alpha} e^{-\frac{z^2}{2}} dz$

For high values of  $m$ , the terms of the product in the right hand side of equation (19) converge to 1. Here, we assume that the product has converged when:  $F_m(\beta, \gamma, \alpha) + F_m(\beta, -\gamma, \alpha) < 1.00001$ <sup>9</sup>.

<sup>6</sup> Both Black and Christie attribute this to the leverage effect, which however cannot adequately explain the extent of the asymmetric response of volatility to positive and negative returns.

<sup>7</sup> See Engle and Ng (1993).

<sup>8</sup> For a proof, see: Heynen, Angelien and Vorst, 1994.

<sup>9</sup> We calculated equation (19) for even higher values of  $m$ , but the results did not change.



### 5.3.2 Data

To examine the change in the nature of stock market volatility before and after liberalisation, stock market data from eight developing countries were collected, namely Argentina, Chile, India, South Korea, Mexico, Pakistan, Philippines and Taiwan. In the current analysis we include three more countries because appropriate data for the current analysis for these countries are available. As a proxy for the stock market we use daily observations from their respective national stock exchange indexes (where available), as given by Datastream: Chile General Price Index, Bombay S.E. National Price Index, Korea S.E. Composite Price Index, Mexico I.P.C. Price Index, Karachi S.E. 100 Price Index, Philippines S.E. Composite Price Index and Taiwan S.E. Weighted Price Index. For Argentina, the only available index is the one constructed by Datastream for the whole Argentinean market. All indexes are expressed in local currency. The sample period begins at 5/1/88 for all markets except for India and Pakistan where the sample period begins at 3/7/89 because of data unavailability and ends at 27/2/98. The reason daily observations are used instead of weekly or monthly, is because the GARCH models that we will utilise are estimated using the Maximum Likelihood (ML) approach<sup>10</sup>, and ML estimators are asymptotic; i.e. they are valid only in large samples. The sample period starts at the beginning of 1988, in order to exclude the October 1987 crash, which could affect the pre-liberalisation volatility results.

The sample period for each country is split into two subperiods, at the date when an important policy which opened the market to foreign investors was introduced. Table 5.1 presents the relevant dates and policies for each country. It should be noted that these policies are not the only policies implemented in these markets, nor are they of the same nature. In Chile for example, although foreign investors are free to purchase equities, they cannot repatriate proceeds from the sale of these equities immediately, making the market relatively “closed” compared to other markets. Also, in South Korea, although the government announced it would liberalise the market in December 1988 and investment preapproval rules softened in January 1990, it was only in January 1992 when foreign investors gained significant access to the market and even after that, some rules

---

<sup>10</sup> All models are estimated using *Microfit 4.0*.

still limited foreign entry to the market. The dates and policies in Table 5.1 serve as indicators of significant changes and do not aim to fully account for the liberalisation process. However, note that it is during the period 1988-1992 that most of the sample countries took very significant steps towards liberalising their markets.

For the two periods (pre- and post- liberalisation) the returns are obtained as the logarithmic changes of the price levels. Since only the conditional variance is of interest in the present analysis, the unpredictable part of the stock returns will be used, instead of the actual stock returns. This can be obtained through a procedure similar to the one used by Pagan and Schwert (1990): first, the logarithmic returns are regressed on a constant and four dummy variables, one for each day from Tuesday through Friday, to remove any day-of-the-week effect. The residuals from this regression are then regressed on their lagged values up to fifth order, to remove any predictable component of the return series. The residuals from the above process, are then used in the GARCH and EGARCH processes to examine volatility prior to and after liberalisation.

**Table 5.1**

Liberalisation of selected emerging markets

<i>Country</i>	<i>Date</i>	<i>Policy</i>
Argentina	December 1989	All limits on foreign capital abolished
Chile	April 1990	Free foreign exchange transactions
India	November 1992	All shares made investable
Mexico	May 1989	All shares made investable
Pakistan	February 1991	All shares made investable
Philippines	November 1991	All shares made investable
South Korea	January 1992	Foreign ownership levels increased
Taiwan	January 1991	Foreign ownership levels increased

Source: Bekaert, G. (1995) Market Integration and Investment Barriers in Emerging Equity Markets, *World Bank Economic Review*, 9, no. 1, pp. 75-107.



A visual inspection of the returns of the sample countries for the sample period (Figures 7.7-7.14, presented at the end of chapter 7) suggests that, in several cases the market is more volatile than usually prior to liberalisation. In these cases it can be argued that liberalisation was expected and the market adjusted before the policy was introduced. Volatility can also persist for some time after the policy is introduced, until the market adjust to the new regime. This adjustment process can affect the results of the models used and show increased volatility during the sub-periods examined. In order to avoid this bias, 200 observations before and 200 observations after the liberalisation policy was introduced, are dropped from the sample.

## **5.4. Methodology and data for the third research question**

### **5.4.1. Testing methodologies**

The third research question is if the ESMs in our sample became more integrated after liberalisation or not. To examine integration among countries we use two approaches. We examine integration with respect to the returns offered by these markets and integration with respect to their riskiness. As markets open up to foreign investors and technology progresses, national stock markets should become more integrated [Garrett and Spyrou (1999)]. Therefore, although there may be short term differences in their returns, over the long term they should share some common trend. Our first test is concerned with identifying any common trends among stock market from the same regions. The riskiness of these markets should also converge (i.e. decline). Integration means that similar assets offer similar returns [Bekaert (1995)]. This can only happen if they belong to the same risk group. Liberalisation exposes national assets to international competition so, if national markets are well diversified, then every national market should have the same risk. In any case, liberalisation should increase prices in these markets and risk should fall as a result of participation externalities [Pagano (1989)] which increase liquidity and help the stock markets develop. The second test we perform examines the riskiness of these markets and if it reduces after the liberalisation policies were implemented.

#### **5.4.1.1. Integration with respect to stock market prices**

In order to test for integration with respect to stock prices among the countries in our sample, we follow the methodology proposed by Garrett and Spyrou (1999). We utilise the cointegration analysis discussed earlier, proposed by Johansen (1988). If the emerging stock markets are integrated, their indexes should have a common trend [Kasa (1992)]. In the framework of the cointegration analysis, this means that we should find a cointegrating vector. This however, is not enough evidence for integration among all the markets used in the estimation. If we establish cointegration, we test which of the stock market indexes are significant in the vector(s) and which are endogenous in the system. In other words, in equation (6), reproduced here:

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + \dots + \Gamma_{k-1} \Delta z_{t-k+1} + \Pi z_{t-k} + u_t, \quad u_t \sim \text{IN}(0, \Sigma) \quad (6)$$

we test all the elements of  $\Pi$  where  $\Pi = \alpha\beta'$ , and  $\beta$  is the vector of the coefficients of the cointegrating indexes and  $\alpha$  is the vector of the speed of adjustment of the vectors towards equilibrium. If any  $\beta$ s are insignificant, their respective indexes are not integrated with the other markets in the model. Furthermore, if any  $\alpha$ s are insignificant, they are exogenous which means that they do not respond to changes in other stock markets trends.

The first step in the analysis is to test for integration among the Asian and then among the Latin American countries. We also test for integration of each one of these groups with one developed stock market. The reason we test for regional cointegration is because if stock markets are indeed integrated, they would be integrated on a regional level rather than on a global level. This is supported empirically by the crises in 1994 and 1997 which affected whole regions. Furthermore, the existence of region-specific developing country funds suggests that stock markets of the same region could be perceived as one asset class [Buckberg (1996)].

For the first estimation, we use all the available data. We then test for the smaller period January 1990 - November 1997. Since most countries liberalised their stock markets in the early 1990s, if liberalisation resulted in a common trend among the stock markets



in any region, we should be able to detect it. Rejection of cointegration for the whole period and acceptance for the smaller period would suggest that liberalisation did indeed integrated these markets, either regionally or globally, depending on our results.

The advantage of this methodology over the application of International Asset Pricing Models used in the literature is that it is assumption free. Solnik (1977) suggests that the best way to test for segmentation is to specify the type of imperfection which might cause it and test it. However, it is very difficult to account for every barrier in every country. Furthermore, the IAPMs assume the existence of a world portfolio. The portfolio usually used in this type of studies is the Morgan Stanley Global index. This however, includes a very small proportion of emerging market equity and although it is considered to be one of the most diversified portfolios offered, there is no reason to assume that it is indeed the world portfolio. Our methodology overcomes these problems by not assuming the existence of a global portfolio and allows to test not only for global integration but for regional integration as well. Additionally, the tests for exogeneity provide us with an insight on the interaction among the emerging stock markets.

#### **5.4.1.2. Integration with respect to risk**

To examine integration with respect to risk, we utilise a methodology from the country risk literature. This methodology takes into account the combined effect of changes in the market value, foreign debt levels and economic stability on the rate of return of our sample of emerging economies. We calculate the financial risk premium for each country for each year of the sample period, and examine if it declines. Given that our methodology is rather unusual, we should first explain how it works and then justify its use in the present analysis.

This methodology is borrowed from the country risk literature<sup>11</sup> and is developed by Clark (1991)<sup>12</sup>. Clark uses the option pricing formula for European call options to estimate the financial risk premium implied by a country's economy. An assumption

---

<sup>11</sup> For a discussion on the literature on country risk see: Eaton *et. al.* (1986).

<sup>12</sup> See also: Clark, Levasseur and Rousseau (1993) pp. 190-203, Clark (1991a) and (1991b).

implicit in this technique is that foreign investors can appropriate a country's assets if a default occurs. In this sense, a country's debt is priced in the same way as corporate debt.

If a country defaults on its loan repayments, it is rather unrealistic to assume that the lenders can confiscate the country's assets<sup>13</sup>. However, from a theoretical point of view this may not be as unrealistic as it seems. Eaton, Gersovitz and Stiglitz (1986), argue that although a country's assets cannot be used as collateral when the borrower is the government of the country, the amount that a government can (or is willing to) appropriate can be used as a constraint on the amount borrowed. If the government can impose lump-sum taxation at no cost, then national wealth and maximal government revenue coincide. In other words, a government committed to repay its debt, can impose taxation to appropriate some or all of the country's assets and hand them over to its creditors, if it is unable to repay the loan. Taxes are costly to raise, therefore, treating national debt as corporate debt will overestimate the value of the assets available to lenders in case of default. Also, it is unlikely that a government would appropriate part or all of the country's wealth and hand it to its creditors in case of default. However, at least from a theoretical point of view, this methodology can provide us with a good estimate of a country's creditworthiness. This is further supported by Shapiro's (1985) argument that "... a nation's ability - and willingness - to repay foreign loans is its wealth"<sup>14</sup>.

In this framework, a country's openness to foreign investors becomes a factor in the analysis because, if legislation prevents foreigners from ownership of the country's assets, then even if the government is willing to appropriate some of the country's wealth to give it to its creditors, it would not be allowed to do so (how this enters the calculations, will become clearer later). In this sense, the amount of wealth available to foreign investors depends on the maximum possible percentage of ownership allowed by the law. In completely open economies, foreigners can have a 100% claim on the country's assets in case of default. In the options pricing framework, this would increase

---

<sup>13</sup> This can only happen if the entire foreign debt is private debt. However, a large proportion of most developing countries' foreign debt is public or publicly guaranteed debt.

<sup>14</sup> Shapiro goes on to argue that a nation's wealth is directly linked to its terms of trade; in other words, its ability to generate foreign currency. This fits well with our framework, in which variables are expressed in dollars because they represent the countries' ability to generate foreign currency.



the value of the underlying asset and result in a lower price for the debt. On the other hand, the closer the economy, the less assets are available to foreign creditors in case of default and the higher the risk premium should be.

#### 5.4.1.2.1 Calculation of the financial risk premium

The Black - Scholes (1973) formula for European call options is given as:

$$C_0 = V_0 N(d_1) - E e^{-rt} N(d_2) \quad (20)$$

where  $C_0$  is the present value of a call option,  $V_0$  is the present value of the underlying security,  $E$  is the exercise price and  $N(d)$  is the value of the standardised normal cumulative distribution evaluated at  $d$ .  $d_1$  and  $d_2$  are given by:

$$d_1 = \frac{\ln(V_0 / E) + (r + \sigma^2 / 2)t}{\sigma \sqrt{t}} \quad (21)$$

$$d_2 = \frac{\ln(V_0 / E) + (r - \sigma^2 / 2)t}{\sigma \sqrt{t}} \quad (22)$$

Equations (20) - (22) express the exact pricing formula for a European call option. The derivation of the formula is based on the creation of a perfectly hedged portfolio by buying the underlying security and selling the number of calls so that the value of the portfolio will be unchanged as the value of the underlying security changes. The portfolio should yield the risk free rate of return.

In the present analysis, we assume that when a country borrows money from abroad, the foreign lenders have a claim on the country's assets. Every time the country borrows money from abroad, it is the same as selling its assets to foreigners but holding an option to buy the assets back. If the country does not pay back its debt, then the foreign lenders keep the country's assets. In the present context,  $C_0$  is the value of the country's residents equity,  $V_0$  i.e. the market value of the country's economy, as calculated above,  $E$  is the

total debt,  $t$  is the maturity of the debt,  $\sigma$  is the standard deviation of the country's returns and  $r$  is the continuous compounded discount rate.

The market value of the country's debt is the difference between the market value of the economy and the value of the residents equity. The next step is to calculate the risk-adjusted rate of interest on the national debt. This is equal to:

$$\text{Risk-adjusted cost of debt} = \frac{\ln(E - \text{market value of debt})}{t} \quad (23)$$

The financial risk premium for the country is the difference between the risk-adjusted cost of debt and the risk free (US) rate.

To estimate the value of the residents' equity we first need to estimate the following variables: the country's market value, the economy's expected return, the standard deviation of the expected return, the total and discounted debt of the country and the maturity of the debt.

#### 5.4.1.2.2 Calculating the market value of the economy

To estimate an economy's market value, Clark starts from the equation:

$$V_t = (b_t - a_t) + (b_{t+1} - a_{t+1}) R^{-1} + \dots + (b_n - a_n) R^{-(n-t)} \quad (24)$$

which simply states that an economy's market value is the economy's future discounted income.  $V_t$  is the country's market value at the beginning of period  $t$ , the "b's" are sales both internal and external, the "a's" are the cost of production of all consumption and investment goods and  $R$  is the discount factor where  $R = 1 + r$ <sup>15</sup>. The "b's" are the value of exports plus the value of domestically produced goods for consumption, which is equal to exports plus consumption minus imports of consumption goods. The "a's" are the value of imports plus the value of internal expenditure for domestically produced final goods and services, which is equal to imports plus consumption minus imports of

---

<sup>15</sup>  $r$  is the appropriate discount rate.



consumption goods. Thus, the term  $b_t - a_t$  is simply exports minus imports. Both “b’s” and “a’s” are expressed in foreign exchange values because we are interested in evaluating an economy based on its ability to generate foreign exchange. If we rearrange equation (24), and ignore interest on net imports we get the identity<sup>16</sup>:

$$r(V_t) = X_t - M_t + (V_{t+1} - V_t) \quad (25)$$

where  $X$  is exports and  $M$  is imports. Equation (6) states that profits before interest and dividends paid abroad are equal to the current account balance before financial services plus net investment.

To estimate the market value for each year, we begin by calculating the accumulated net fixed capital formation (NFCF) of that year and previous years. For example, if our starting year is 1967, then the market value for 1970 would be the sum of the NFCF from 1967 to 1970. This of course assumes that the market value in 1966 was zero. In order to estimate the market value for the year before the first year of our sample, we run a regression on equation (26):

$$X_t - M_t + (V_{t+1} - V_t) = c + r(V_t) \quad (26)$$

In equation (26),  $c$  is a constant representing profits generated with the capital outstanding at the end of the period preceding the first year of the sample period and  $r$  represents the return for the sample period. For the regression we use 18 years in order to capture about two trading cycles<sup>17</sup>. If we capitalise the constant from equation (26), i.e.  $c / r$ , we obtain the market value of the country for the year before the first year of our sample period. We then add to this value the NFCF for the first year of our sample period to obtain the market value of the economy for that year. To obtain the market value for the next year we add to the market value of the first year the NFCF for the next year, and

---

<sup>16</sup> It should be noted that  $V_t$  is market value at the beginning of period  $t$ ,  $V_{t+1}$  is market value at the beginning of period  $t+1$  (or at the end of period  $t$ ), while  $X_t$  and  $M_t$  refer to exports and imports *during* period  $t$ .

<sup>17</sup> See: Hicks (1978).

so on. All calculations are carried out using local currency values. Once the market values are estimated, they are converted in dollars using the end of period exchange rate.

#### **5.4.1.2.3 Calculating the economy's expected return and the standard deviation of the return**

To calculate the economy's expected return, we first calculate the economy's actual return for each year. The profits for an economy are calculated using equation (25). They are the sum of net exports and the change in market value for that year. To find the return for that year, we simply divide the year's profits by last year's market value. Once we calculate the return for each year of our sample period, we then find the expected return. This is the average return of the last 18 years. For example, the expected return for 1984 is the average return from 1967 to 1984. Note that the year 1984 is included as well because the analysis uses ex post data.

The standard deviation of the expected return is calculated as the standard deviation of the last 18 years' returns. Again, the return for the year for which we calculate the standard deviation is included. For example, the standard deviation of the expected return for 1984 is the standard deviation of the returns from 1967 to 1984. For our analysis we use the 18 year rolling standard deviation.

#### **5.4.1.2.4 Calculating the economy's total and discounted debt**

Every economy's total debt is the sum of the principal repayments and the interest that the country will have to pay in order to pay off all of its debt. Projections of the principal and interest payments for our sample countries are available from publications<sup>18</sup>. Once we have the total amount to be paid by each country we discount it in order to find the present value of the debt. The discount rate used for the short term debt, is the average Eurodollar rate on 6 month deposits in London. For the long term debt, the discount rate used is the continuous compounded annual average rate on US government ten year constant maturity<sup>19</sup>.

---

<sup>18</sup> The published projections cover payments for the next ten years after the year they refer to. The total amount repaid has to be estimated. The estimation procedure is explained in appendix 4.

<sup>19</sup> Ideally, we should discount every payment using the risk free rate corresponding to its maturity. This however is unavailable. The interest rate that we use is proposed by Clark (1991) p. 92.



#### 5.4.1.2.5 Calculating the maturity of the debt

The maturity of the debt is calculated using the following formula:

$$E e^{-rt} = \sum_{T=1}^n CF_T e^{-rT} \quad (27)$$

where  $E$  is the total value of the debt,  $t$  is its maturity,  $r$  is the discount rate and  $CF_T$  is the discounted payments. Since we have already calculated the discounted cash payments, we solve equation (23) for  $t$  to find the debt's maturity. This gives:

$$t = \frac{\ln(E / \sum_{T=1}^n CF_T e^{-rT})}{r} \quad (28)$$

In equation (24),  $r$  is a continuously compounded rate.

#### 5.4.1.2.6 The subordination principle

In the above analysis, we assume that borrowers 'sell' their assets to their creditors, while owning a call option on these assets. In reality however, this may not be possible in the case of national debt. Most developing countries legislation, prevents foreigners from owning all or part of their market. In most cases, foreigners are banned from ownership in sectors which are considered of national importance (e.g. defence industry or oil field exploration) and they are allowed ownership, either total or partial, in all other sectors. Therefore, even if the government was willing to hand over the nations wealth to its creditors in case of default, it would be prevented from doing so by law. To address this problem, in the options pricing formula we use as market value the proportion of the market value that foreigners can legally appropriate. For example, until 1989, foreigners were allowed to own up to 49% of shares of any Mexican company. So, in the options pricing formula, the market value used is 49% of the market value of the Mexican economy until 1989. These percentages change as the countries in our sample liberalised their economies. It should be noted that in most cases, identifying the exact proportion of the economy that foreigners are allowed to own is extremely difficult. That is because in most countries there are different restrictions on different sectors of the economy<sup>20</sup>. Since

---

<sup>20</sup> For example, in 1989, a law introduced in Mexico allowed foreigners to own up to 100% in certain sectors (e.g. textiles), up to 49% in other sectors (e.g. fishing) and reserved some sectors for Mexicans only (e.g. forestry) (see: Banco Nacional de Mexico, 1989).

there are no available data to calculate the proportion of each sector in every economy, it is not possible to identify exactly the proportion of the economy open to foreign investors. In our analysis, the percentages we use are those published by the International Monetary Fund. However, in order to accommodate discrepancies due to the different restrictions on different sectors, we also estimate the financial risk premium using alternative percentages.

#### **5.4.2. Data**

For the first test, we utilise monthly data of the stock market indexes for Argentina, Chile, India, Mexico, Pakistan, Philippines, South Korea and Taiwan. The data are constructed by the IFC and are provided by Datastream. The data for Latin America cover the period January 1976 to November 1997. The data for the Asian region cover the period January 1985 to November 1997. The data we use to proxy the developed markets are the monthly S&P 500 Index and the FTSE 100 index, from January 1976 to November 1997

For the second test, we utilise data from six developing countries, namely: Chile, India, Mexico, Pakistan, Philippines and South Korea. The sample period is from 1967 to 1996. The first 18 years, 1967 to 1984 are used for estimation of the economies' return and standard deviation. The financial risk premium is then estimated for each year from 1984 to 1996, except from South Korea where the financial risk premium is estimated until 1994 due to lack of data. The data for the analysis were obtained from various publications. The data for exports and imports were obtained from various volumes of the *Balance of Payments Statistical Yearbook*. The data for the national debts were obtained from various volumes of the *World Debt Tables*. The macroeconomic data (net fixed capital formation and interest rates) were obtained from various volumes of the *International Financial Statistics*. Information on ownership levels allowed in each country for foreigners was obtained from various annual reports of *Exchange Arrangements and Exchange Restrictions*, published by the International Monetary Fund. The data used in the analysis are annual.

#### **5.5. Summary and Conclusions**



In this chapter we presented and tried to justify the methodologies we follow to examine our research questions. The chosen methodologies aim to overcome some of the problems involved in the studies of other researchers.

More specifically, in order to examine the relationship between the financial sectors and the real part of the economy, we follow a time series analysis. The chosen methodology is the Johansen cointegration methodology because it can i) account for the long run relationships between the variables of interest, ii) account for different relationships among the variables in the form of separate cointegrating vectors and iii) provide us with statistical evidence as to which variables are endogenous.

For the second research question we adopt two processes from the ARCH family, namely the GARCH and the EGARCH process. These two processes have been empirically found to be excellent instruments for measuring volatility. They can also deal with the usual problems which plague financial data such as skewness and kurtosis. The only problem with these processes is that they are atheoretical, i.e. they have no obvious theoretical justification. They should, however, be able to provide us with a good insight on how the nature of volatility changed after liberalisation policies were implemented in these countries regarding their respective stock markets.

For our third question we employ two methodologies. We examine convergence with respect to stock prices and with respect to risk. To examine integration with respect to stock prices we employ cointegration analysis. We examine if the indices of the national stock markets of the two regions follow a common trend. To examine integration with respect to risk we employ a methodology used in the country risk literature.

Before we present our results, we should explain that one of the problems we face is the availability of data. The data we use where the best available proxies for the variables we wish to examine. We do not however have a long period of observations and we expect that this could affect our results. However, we believe that our results can still provide us with a good insight of the issues we examine. Having discussed the theories on the issues

we examine and the methodologies we employ to test them, we can now present our empirical results.



## **CHAPTER 6: EMPIRICAL ANALYSIS OF THE RELATIONSHIP BETWEEN THE STOCK MARKET AND THE REAL ECONOMY.**

### **6.1. Introduction**

In this chapter we present the results from the empirical analysis on the relationship between the financial sectors and the real economy in our sample of countries. The model we test is the Boyd and Smith (1996) model presented in chapter two. The model shows that the the stock market and the banking sector can affect positively economic growth. In turn, as the economy develops it should result in the development of both the financial sectors. If the model holds in our sample countries, we should find a that the variables of interest follow a common trend. They should also be endogenous since they not only affect each other but are also affected by each other.

The stock market volatility variable is included to account for the negative effect of stock market volatility on the real economy, as it is predicted by the theory. Keynesian economists have stressed the negative role of the stock market on the economy because of increased stock price volatility [e.g. Singh (1992)]. These economists claim that this effect should be particularly evident in emerging economies because stock markets there are inefficient and very volatile. If this is true, we should find a negative relationship between stock market volatility and economic growth.

The Boyd and Smith (1996) model does not specify the relationship between the two financial sectors. It states that at the first stages of development the stock market will ‘steal’ market share from the banking sector. In the later stages of development though, their role is complementary because they provide different financial services. The countries in our sample are most likely not at the first stage of development, so the two sectors should be complementary. However, we do not make any such assumptions, so if we do not find a positive relationship between the two sectors, we shall not take it as evidence that the model does not hold.

The methodology we follow is the Johansen cointegration methodology which was presented in chapter 5. The data used are monthly observations. We should stress again that our sample period is not very long so our results should be treated with caution.

## **6.2. Empirical results**

We begin the analysis by testing for unit roots for the variables used. The results are presented in appendix 2. All the three basic variables (industrial production index, stock market value and the banking sector proxy) are  $I(1)$  for all countries. The standard deviation of stock returns is also  $I(1)$  for all countries except South Korea. The South Korean government established a stock market stabilisation fund which was used to buy and sell shares when the stock market became excessively volatile. It is therefore, expected that the volatility of the South Korean index would be stationary. The volatility measure for South Korea is not used in the analysis, since it is not likely to explain the true volatility of the stock market.

We then test for the correct lag order of the VAR model for each country. We select the order for the VAR using the Akaike Information Criterion and the Schwarz Bayesian Criterion reported by Microfit. However, for some countries, for the chosen lag length there is still serial correlation which disappears when we add more lags. The next step in the analysis is to find the number of cointegration vectors for each country and choose the correct specification with respect to deterministic variables. To find that, we follow the methodology discussed previously and the results are reported in appendix 3 and discussed for each country separately.



### 6.2.1 Chile

Table 6.1 presents the results for Chile. There are two cointegration vectors. In the first vector two of the variables are endogenous: the industrial production and the banking sector, while in the second vector only the stock market development is endogenous. The cointegrating vectors are presented normalised on each of the endogenous variables. In the first vector, all the variables are significant. The first two equations reported are the first vector normalised first on the industrial production and then on the banking sector development.

The first equation shows the relationship between economic growth and the financial sectors. As we see, industrial production is positively related to the stock market development and negatively related to the banking sector development and the stock market volatility. The positive effect of the stock market on economic growth, demonstrates the benefits of having a stock market in a liberalised economy. During the last two decades, the Chilean economy became an increasingly open economy, with very little interference from the state. The stock market was open to both domestic and foreign residents. However, capital repatriation was restricted and Chile did not attract as much capital as it could. The benefit of this restriction is that Chile was immunised from sudden capital flight. This proved especially valuable during the Asian crisis of 1997. The negative relationship between stock market development and stock market volatility goes to further justify the restriction on capital repatriation. Had Chile opened up its capital account completely, it could introduce volatility into its stock market, which according to our results would damage the real economy.

The negative relationship between the industrial production and the banking sector can be attributed to the problems faced by Chilean banks. After the 1982 crisis, most Chilean banks were unable to service their foreign debt. To avoid bankruptcy, the state bailed them out by acquiring their bad loans. For most of the sample period, banks in Chile were not very productive. They had to buy back their bad loans from the central bank. They also had to compete with alternative sources of finance for firms, such as the privatised pension funds and the debt for equity swap programmes initiated by the government in

1985, which proved to be very successful. On top of that, the bail out by the state came at a high cost. For these reasons, we should expect that the banking sector in Chile did not contribute to economic development and hence the negative relationship in our results. The fact that the banking sector was a burden to the economy during that period is better demonstrated by the fact that it is endogenous in the model. As it is shown by the first two equations, there is a bi-directional negative relationship between the banking sector and economic growth. The endogeneity of the banking sector also reflects the bad practices adopted by the banks (excessive foreign debt and unmonitored lending to affiliated companies). The positive relationship between stock market development and the banking sector and the negative relationship between stock market volatility and the banking sector indicate complementarity between the two financial sectors, but not in the way implied by the Boyd and Smith model. Because of the problems faced by the banking sector, it is likely that between the two, the stock market became the primary financial sector while the banking sector simply followed, covering the increased need for financial services. The fact that the two sectors are not complements is shown by the fact that the banking sector is insignificant in the third equation. Therefore, we cannot find any evidence suggesting that the banking sector causes growth in the stock market (as it is implied by the Boyd and Smith model).

The third equation, together with the first, shows that the relationship between stock market development and industrial production is bi-directional, which supports the endogenous growth model of Boyd and Smith. The results for Chile suggest that the financial sector in the country is actually enhancing economic growth and as the economy develops, the financial sector develops as well. The results would completely agree with the scenario provided by Boyd and Smith, except for the role of the banking sector. Because the sector was not properly regulated, it nearly went bankrupt and was rescued at a high cost to the real economy. Therefore, it did not contribute to economic development.



**Table 6.1**

Cointegration results for Economic Growth and Financial Development in Chile  
from 1982 M1 to 1997 M10

LINDPR : Logarithm of industrial production index  
LMV : Logarithm of deflated stock market capitalisation  
LCR : Logarithm of deflated credit given to private enterprises by banks  
LVOL : Logarithm of stock market volatility

H <sub>0</sub> : rank=p	Trace	Cr Value (95%)	Cr Value (90%)	Max- eigenvalue	Cr Val (95%)	Cr Val (90%)
p = 0	58.87**	53.48	49.95	23.11	28.27	25.8
p ≤ 1	35.77**	34.87	31.93	19.67	22.04	19.86
p ≤ 2	16.10	20.18	17.88	10.73	15.87	13.81
p ≤ 3	5.37	9.16	7.53	5.37	9.16	7.53

Vector autocorrelation test: F(32, 399) = 0.796 [0.78]

*Weak exogeneity tests*

LINDPR	exogenous to the system:	Chi-sq(2) = 7.64	[0.02]**
LMV	exogenous to the system:	Chi-sq(2) = 10.84	[0.00]**
LCR	exogenous to the system:	Chi-sq(2) = 7.07	[0.03]**
LVOL	exogenous to the system:	Chi-sq(2) = 0.46	[0.80]

LINDPR exogenous to the first vector:	t-ratio: -2.53 [0.01]**
LINDPR exogenous to the second vector:	t-ratio: -0.68 [0.50]
LMV exogenous to the first vector:	t-ratio: 0.70 [0.48]
LMV exogenous to the second vector:	t-ratio: -3.52 [0.00]**
LCR exogenous to the first vector:	t-ratio: 2.67 [0.01]**
LCR exogenous to the second vector:	t-ratio: -0.37 [0.71]

*Joint test of restrictions in the cointegration vector and exogeneity tests:*

Chi-sq (5) = 2.29 [0.81]

*Restricted Cointegration results*

LINDPR = 5.22 + 0.21 LMV - 0.93 LCR - 0.35 LVOL  
LCR = 5.62 - 1.08 LINDPR + 0.23 LMV - 0.38 LVOL  
LMV = -15.3 + 5.81 LINDPR

- The Chi-sq tests for weak exogeneity are LR tests.
- Numbers in brackets are probability values.
- Cr. V. means critical value.
- \* and \*\* indicate significance at the 10% and the 5% level respectively.

### 6.2.2 India

The results for India are presented in Table 6.2. We can see that the two stock market variables (LMV and LVOL) are exogenous to the system and insignificant in the cointegrating vector. This is hardly surprising considering the way the Indian economy operates. Most industries in India are controlled by the state. These industries are heavily subsidised and not allowed to fail. It is therefore, not surprising to find that the stock market cannot perform any role in the Indian economy. The primary function of a stock market is to act as a pricing mechanism. Provided the market generates enough information for market analysts to work with, prices on the stock market should reflect the value and prospects of every company. A very important prerequisite for this mechanism to work, is a free (or near free) market. In India, this is not the case. Although companies may raise capital through the stock market, the government intervenes in the market place. Therefore, it is doubtful whether capital raised through the stock market can be put in their most productive use. Furthermore, some of the shares traded on the market are minority shares of state controlled companies. Since most companies in India are not allowed to declare bankruptcy, their share price will reflect not their 'true value' (i.e. the price they would have in an efficient market), but it will include the prospect of government subsidy in case they are in trouble.

The cointegrating vector is normalised on the banking variable since this the only endogenous variable in the system and we could find clear evidence of error correction. The industrial production is exogenous, indicating there is no effect from the financial sectors to the real economy. The explanation for the equation in Table 6.2, could be in the taxation system in India and the heavily subsidised industries. Tax rates in India have always been very high. This is necessary, in order to fund the subsidies given to companies and individuals. Since the source of these funds are taxes, the level of money available to be distributed as subsidies is directly related to economic growth and the performance of companies. The more the economy grows, the more money is available to government through taxes. A lot of that money is distributed through the state dominated banking system in the form of low interest rate loans. Therefore, industrial production is positively correlated to the banking sector development. However, this relationship is



uni-directional. The credit provided to companies does not result in economic growth, according to our results. This is additional evidence against financial repression, in agreement with those presented by Demetriades and Luintel (1996 and 1997).

**Table 6.2**  
Cointegration results for Economic Growth and Financial Development in India  
from 1977 M1 to 1997 M11

LINDPR : Logarithm of industrial production index  
LMV : Logarithm of deflated stock market capitalisation  
LCR : Logarithm of deflated credit given to private enterprises by banks  
LVOL : Logarithm of stock market volatility

H <sub>0</sub> : rank=p	Trace	Cr Val (95%)	Cr Val (90%)	Max- eigenvalue	Cr Val (95%)	CrVal (90%)
p = 0	51.47*	53.48	49.95	19.92	28.27	25.8
p ≤ 1	31.55	34.87	31.93	14.85	22.04	19.86
p ≤ 2	16.7	20.18	17.88	9.50	15.87	13.81
p ≤ 3	7.20	9.16	7.53	7.20	9.16	7.53

Vector autocorrelation test: F(112, 594) = 1.007 [0.47]

*Weak exogeneity tests*

LINDPR exogenous to the system: Chi-sq(1) = 0.16 [0.69]  
LMV exogenous to the system: Chi-sq(1) = 0.24 [0.62]  
LCR exogenous to the system: Chi-sq(1) = 4.86 [0.03]\*  
LVOL exogenous to the system: Chi-sq(1) = 1.79 [0.18]

*Joint test of restrictions in the cointegration vector and exogeneity tests:*

Chi-sq (5) = 5.95 [0.31]

*Restricted Cointegration results*

LCR = -0.87 + 0.74 LINDPR

- The Chi-sq tests for weak exogeneity are LR tests.
- Numbers in brackets are probability values.
- Cr. V. means critical value.
- \* and \*\* indicate significance at the 10% and the 5% level respectively.

### 6.2.3 Mexico

The results for Mexico are presented in Table 6.3. There is one cointegration vector and there are two endogenous variables: the industrial production and the banking sector. The volatility variable is insignificant in the vector and therefore dropped. The two equations are presented normalised in each of the two endogenous variables. The first equation describes the industrial production development. This is positively related to the stock market development and negatively related to the banking sector development. Mexico liberalised its stock market to a much higher degree than any of the other countries in our sample. Foreign investors were allowed to invest in the stock market and repatriate their money freely. This resulted in high foreign investment which in 1994 had reached about \$50 billion. From that money, about half was indirect investment. Although the openness in Mexico's market has been blamed by several economists for the 1994 crisis, it resulted in investment which affected positively the level of economic growth, as it can be seen from our results.

The banking sector on the other hand, is negatively related with industrial production. This comes as no surprise considering the state of the banking sector in the country. Since the 1982 crisis, banks never really recovered in Mexico. For the decade which they were nationalised, most banks hardly provided any credit to companies and individuals, and were run inefficiently. During that decade they were trying to recover from the losses they incurred during the 1982 crisis. After they were privatised, most banks took risks which nearly drove them bankrupt. The fixed exchange rate encouraged them to borrow dollars and lend pesos, a practice which in the devaluation of 1994 proved almost fatal. After the 1994 crisis, most banks were almost bankrupt and were bailed out by the government. The cost of the bail out was estimated by the Mexican government to be 90 billion pesos, equivalent to 5% of 1995 GDP. However, Moody's, the credit rating agency, estimated that the cost could be three times as high. Therefore, the practices adopted by the Mexican banking have proved costly to Mexico's real economy.

The second equation shows the relationship between the banking sector and the industrial production and stock market. The industrial production is negatively related to the

banking sector, probably for all the reasons discussed above. Like in Chile, we can find a negative bi-directional relationship between the banking sector and the real economy. The rest of the equation shows the relationship between the banking sector and the stock market. The results show that the two financial sectors are positively related, indicating complementarity. However, the results do not support the complementarity implied in the Boyd and Smith model. In their model, causality goes from the banking sector (which is assumed to be the primary financial sector) to stock market development. In Mexico, the stock market is exogenous, meaning that it is not affected by the banking sector. Instead, the banking sector is driven by the stock market. The most probable explanation for this, is that in Mexico the stock market has been a lot more effective in providing finance to companies and assessing risk than the banking sector. This could be why our results show that the primary financial sector has become the stock market, while the banking sector simply follows.



**Table 6.3**

Cointegration results for Economic Growth and Financial Development in Mexico  
from 1977 M1 to 1997 M8

LINDPR : Logarithm of industrial production index  
LMV : Logarithm of deflated stock market capitalisation  
LCR : Logarithm of deflated credit given to private enterprises by banks  
LVOL : Logarithm of stock market volatility

H <sub>0</sub> : rank=p	Trace	Cr Val (95%)	Cr Val (90%)	Max- eigenvalue	Cr Val (95%)	Cr Val (90%)
p = 0	52.93*	53.48	49.95	35.94**	28.27	25.8
p ≤ 1	17.00	34.87	31.93	11.64	22.04	19.86
p ≤ 2	5.36	20.18	17.88	4.13	15.87	13.81
p ≤ 3	1.23	9.16	7.53	1.23	9.16	7.53

Vector autocorrelation test: F(32, 816) = 1.042 [0.40]

*Weak exogeneity tests*

LINDPR exogenous to the system: Chi-sq(1) = 11.22 [0.00]\*\*  
LMV exogenous to the system: Chi-sq(1) = 2.23 [0.14]  
LCR exogenous to the system: Chi-sq(1) = 13.58 [0.00]\*\*  
LVOL exogenous to the system: Chi-sq(1) = 1.08 [0.30]

*Joint test of restrictions in the cointegration vector and exogeneity tests:*

Chi-sq (3) = 5.70 [0.13]

*Restricted Cointegration results*

LINDPR= 5.01 + 0.18 LMV - 0.21 LCR

LCR = 24.07 + 0.86 LMV - 4.8 LINDPR

- The Chi-sq tests for weak exogeneity are LR tests.
- Numbers in brackets are probability values.
- Cr. V. means critical value.
- \* and \*\* indicate significance at the 10% and the 5% level respectively.

#### 6.2.4 South Korea

Table 6.4 presents the results for South Korea. The constant is restricted and there are no trends in the model. There is only one cointegration vector. From the variables used only the industrial production is endogenous. All variables are significant in the cointegrating vector. The interpretation of the equation for industrial production is rather straightforward: the stock market and the banking sector contributed positively to economic development, which is what the financial liberalisation advocates support.

However, the results do not support the endogenous growth model of Boyd and Smith because this positive relationship is not bi-directional. In the case of South Korea it is easy to interpret the results and understand why this is what we should expect. It is well known that the South Korean government has intervened in the economy with great success. During the sample period which we examine, thanks to central planning of the economy, South Korea became one of the biggest exporters in the world. Both the stock market and the banking sector operated in such a way as to promote economic growth (always under the guidance of the Ministry of Finance). The banking sector provided key industries with cheap finance and the stock market was artificially boosted by debt-equity limits and foreign borrowing ceilings. Both financial sectors performed well and helped industries expand. The reason we do not find a bi-directional relationship (both financial sector variables are exogenous) is because the financial sector in South Korea did not develop according to market demand but according to government plan. Therefore, even if there was increased demand for financial services, these sectors could not expand and grow together with the economy because the state dictated their development.

The results presented here support what other researchers have found. The South Korean government has been very successful in manipulating the economy unlike several other governments which chose to follow interventionist policies and financial repression. However, if we accept that the path to economic growth is through the model presented by Boyd and Smith, then clearly the South Korean economy would face problems. The model suggests that economic growth requires a developing financial sector to service it

and the South Korean market does not show any evidence of that. Of course, with the benefit of hindsight, it is easy to see how this affected the South Korean economy and resulted in its collapse. The 1997 crisis, which is not included in our sample, was partly the result of huge accumulated debts by South Korean conglomerates. The development of a financial market could have prevented that by allowing market forces to operate and limit credit to already overstretched companies. Of course, if this was the case during the last twenty years, it is unlikely that the South Korean economy would grow at the rate it did. The stock market and banking sector served their purpose well in providing companies with cheap capital and accelerating growth. However, the results presented here on the interrelationship of the financial sector and the real economy show that this could not be sustained.



**Table 6.4**

Cointegration results for Economic Growth and Financial Development in South Korea  
from 1976 M1 to 1997 M11

LINDPR : Logarithm of industrial production index

LMV : Logarithm of deflated stock market capitalisation

LCR : Logarithm of deflated credit given to private enterprises by banks

H <sub>0</sub> : rank=p	Trace	Cr Val (95%)	Cr Val (90%)	Max- eigenvalue	Cr Val (95%)	CrVal (90%)
p = 0	42.30**	34.87	31.93	28.11**	22.04	19.86
p ≤ 1	14.18	20.18	17.88	12.34	15.87	13.81
p ≤ 2	1.85	9.16	7.53	1.85	9.16	7.53

Vector autocorrelation test: F(18, 560) = 1.412 [0.12]

*Weak exogeneity tests*

LINDPR exogenous to the system: Chi-sq(1) = 15.67 [0.00]\*\*

LMV exogenous to the system: Chi-sq(1) = 1.15 [0.28]

LCR exogenous to the system: Chi-sq(1) = 0.15 [0.70]

*Joint test of restrictions in the cointegration vector and exogeneity tests:* Chi-sq (2) = 1.58 [0.45]

*Restricted Cointegration results*

LINDPR = -0.83 + 0.045 LMV + 0.71 LCR

- The Chi-sq tests for weak exogeneity are LR tests.
- Numbers in brackets are probability values.
- Cr. V. means critical value.
- \* and \*\* indicate significance at the 10% and the 5% level respectively.

### 6.2.5 Taiwan

The results for Taiwan are presented in Table 6.5. There is one cointegration vector and the stock market and industrial production variables are endogenous<sup>1</sup>. After imposing restrictions, we find that all four variables are significant in the cointegrating vector. We could find evidence of error correction for both the endogenous variables, so the vector is normalised on the LINDPR and LMV.

Not surprisingly, we fail to find a positive relationship between the stock market development proxy and the real economy. We should expect that because of the structure of the Taiwanese economy and its stock market. Taiwan experienced rapid economic growth because of its exports. The companies which generated that growth were not big corporations - like in South Korea - but the thousands of small and medium size enterprises which were not listed in the stock market. The negative relationship between the stock market and the economy can be attributed to the role of the stock market in Taiwan. During the late 1980s, the Taiwanese stock market experienced a spectacular boom. It was then viewed as a way to get rich fast. The boom was sustained for some years because of the huge amounts that residents invested in equity. Since the stock market offered very high rates of return it became a more attractive form of investment than physical investment. The negative relationship shown in the first equation of Table 6.5, could reflect this effect. It is surprising, however, to find a positive effect between industrial production and stock market volatility.

In the first equation, we can also see a positive relationship between the banking sector and industrial production. At the beginning of the sample period, the banking sector in Taiwan was relatively underdeveloped compared to other developing countries. However, during the late 1980s the sector was slowly liberalised, and more able to perform its role in the economy. It should also be noted that the variable we use in this analysis, does not represent the banking sector development only. It also captures the large number of credit houses which offered loans to Taiwanese businesses (legally or otherwise). In total, both

---

<sup>1</sup> Using the max-eigenvalue statistic, at the 10% level there are two cointegration vectors. However, after running several tests on the second vector, it was found to be insignificant.

the official and unofficial financial institutions provided credit to businesses and helped them expand.

The vector normalised on the stock market proxy (2nd equation), shows that the stock market is positively related to its volatility and the M2 money supply and negatively related to the industrial production. This equation describes the relationship between the two financial sectors. It shows complementarity since they are positively related. However, it is doubtful whether this complementarity indicates the sectors' role in companies financing. Given the huge black economy in Taiwan, the speculative nature of its stock market, the capital restrictions which created the booms and busts in the stock market and the size of the underground financial service sector, it is more likely that this complementarity simply reflects the transfer of money from one sector to the other when investors chased higher short term returns. The results for Taiwan support the financial liberalisation thesis, because they indicate that the repressed financial sector is unproductive and isolated from the real economy.



**Table 6.5**

Cointegration results for Economic Growth and Financial Development in Taiwan  
from 1977 M1 to 1997 M11

LINDPR : Logarithm of industrial production index  
LMV : Logarithm of deflated stock market capitalisation  
LM2 : Logarithm of deflated M2 money supply  
LVOL : Logarithm of stock market volatility

H <sub>0</sub> : rank=p	Trace	Cr Val (95%)	Cr Val (90%)	Max- eigenvalue	Cr Val (95%)	CrVal (90%)
p = 0	66.90**	48.88	45.70	39.80**	27.42	24.99
p ≤ 1	27.11	31.54	28.78	21.07*	21.12	19.02
p ≤ 2	6.04	17.86	15.75	5.30	14.88	12.98
p ≤ 3	0.73	8.07	6.50	0.73	8.07	6.50

Vector autocorrelation test: F(112, 713) = 0.971 [0.56]

*Weak exogeneity tests*

LINDPR exogenous to the system: Chi-sq(1) = 12.59 [0.00]\*\*  
LMV exogenous to the system: Chi-sq(1) = 5.35 [0.02]\*  
LM2 exogenous to the system: Chi-sq(1) = 1.80 [0.18]  
LVOL exogenous to the system: Chi-sq(1) = 3.15 [0.07]

*Joint test of restrictions in the cointegration vector and exogeneity tests:* Chi-sq (2) = 4.22 [0.12]

*Restricted Cointegration results*

LINDPR = 5.46 LM2 - 1.5 LMV + 0.973 LVOL

LMV = 3.64 LM2 - 6.66 LINDPR + 0.65 LVOL

- The Chi-sq tests for weak exogeneity are LR tests.
- Numbers in brackets are probability values.
- Cr. V. means critical value.
- \* and \*\* indicate significance at the 10% and the 5% level respectively.

### ***6.3. Discussion of empirical results***

The results show some similarities across countries and some interesting differences. For the three Asian economies, we cannot find any strong evidence indicating a positive effect from the financial sector to the real economy. Instead, the results for these countries highlight their weaknesses. The results for the three Asian countries are similar in the sense that they do not show any significant interactions between the financial sectors and the real economy. In each case, we could only identify one cointegrating vector with only one endogenous variable (except from Taiwan), meaning that the variables in the model do not act as a system (each one affecting the other) but rather in isolation. Our results probably reflect the economic policies followed by the national governments of these countries. In all three countries economic policy has placed severe restrictions on the economy.

The results for South Korea indicate a positive effect from the financial sectors to the economy, which however, cannot be sustained for long. The weakness of the financial system in that country became clear during the 1997 crisis. The main culprits for this crisis were the weak financial institutions which were not allowed to develop along with the real economy based on market forces. Instead, their lending was based on government policy. However, it should be noted that had this thesis been written three years ago, it would not be clear how the weaknesses of this system would manifest themselves.

The effect of restrictions on the economy are most evident in India where the state interferes with the operation of virtually the whole market. Since companies are not allowed to declare bankruptcy, any sense of market mechanism is eliminated. It is doubtful that the creation of a stock market can have any positive effect on the real economy in such an environment because the most important prerequisite for the proper function of a stock market is market forces. Even if private companies could raise capital through the stock market, the price they would have to pay for that capital would be severely distorted.

The Taiwanese economy is more liberal than the Indian economy, but the restrictions which are in place make the function of the stock market very difficult. To begin with, it is doubtful whether the creation of a stock market is appropriate for an economy such as the Taiwanese economy. The success of Taiwan was based on the thousands of small enterprises which became major exporters in the world market. Since most of these companies are too small to be listed on a stock exchange, the benefits from creating one are not obvious. The fact that the stock market was not a success in Taiwan (in terms of helping companies to raise finance and act as a pricing mechanism) could be seen from the small number of companies which sought a listing on the exchange. Of course given time, as the most successful companies grow, they could seek a listing on the stock exchange and then its existence could indeed serve a purpose. What we argue here, is that the creation of the Taiwanese stock market was rather premature. However, it would probably not earn the reputation of a casino had the government not put restrictions on the country's capital account. Since residents could not find an outlet for the fortunes they made from their exports, the stock market and the property market were prime candidates. What followed was a series of speculative booms and busts. One positive aspect of this situation was that these booms and busts did not threaten the real economy since it was not directly related to the stock market. However, the speculation fever which overtook Taiwan during the early 90's did have a cost. A lot of money was chasing quick profits instead of being put into the production process. This can probably justify the negative effect of the stock market on the economy.

The results for the two Latin American countries present a completely different story and provide an insight on the interaction between the financial sectors and the real economy in these countries. In both countries the stock market has a positive effect on economic development. Also, in both countries the banking sector has a negative effect on economic development. Another similarity between the two countries is that the banking sector is endogenous in the model and is negatively related to the economy and positively related to the stock market. Both Chile and Mexico liberalised their economies to a much greater extent than most other developing countries (certainly a lot more than the Asian countries examined here). Both Chile and Mexico tried to create a market driven economy with some success. Since the stock market was allowed to play its role as a



pricing mechanism, it could possibly contribute to the economic development of the two countries.

The negative effect of the banking sector to the economy can be attributed to the bad state of the banking sector in Chile and Mexico. The banking sectors in these countries came into serious trouble during the debt crisis in 1982. The main reason was excessive risk taking and very poor supervision of the banks by the government. The fact that both Chile and Mexico had fixed their currencies with the dollar added to the problem since banks were encouraged to increase their foreign liabilities. For the most part of our sample period, most banks in Chile and Mexico were not profitable and were relying on state aid in order to survive. It is therefore not surprising to find a negative relationship between the banking sector and the real economy in both countries.

The third similarity between the two countries is the positive relationship between banks and the stock market. This relationship does not necessarily indicate complementarity since it is uni-directional (the stock market causes the banking sector but the opposite is not true). In the Boyd and Smith model, the banks are the primary source of finance for companies while the stock market follows. Our results suggest the opposite: the banking sector follows the stock market development. The most probable explanation is the bad state of the banking sector in both countries. Since banks are unable to provide finance to companies, it is natural that in a free market other types of financial institutions will play that role. It is not unreasonable to say therefore, that between the two sectors used in this analysis, the stock market became the primary source of finance for companies while the banking sector was relatively inactive. The results can be justified on the basis that banks were following the stock market in terms of development. This result becomes more justifiable if we consider that towards the beginning of our sample period banks got into trouble and it is only towards the end of our sample period that most banks in the two countries sorted out their problems and became profitable.

The similarities in the results of the two countries end there. There are two important differences to consider. One is that in Chile the stock market development is endogenous and positively affected by the real economy and the second that the stock market

volatility is significant only for Chile. A possible explanation for both of these differences is the capital repatriation restrictions in Chile that were in place for most of our sample period. These restrictions shielded the Chilean stock market from external shocks. For example, the Mexican stock market suffered losses in 1982 when the US economy went into recession. US interest rates jumped to 17% and suddenly emerging markets did not look very profitable to investors any more. A lot of money left Mexico, as well as other emerging economies. It would be difficult for Chile to be affected by factors that are not directly related to its economy, through its stock market. Because of the restrictions, most investors who invested in the Chilean market went in for the long term. Therefore, the prospects of the national economy became a major force behind the performance of the stock market. This can explain the endogeneity of the stock market in our model.

The significance of the volatility variable can also be attributed to the same reason. The volatility variable has a negative sign in both equations for Chile, indicating that lower volatility is associated with higher stock market development. A lot of investors who entered other emerging stock markets tried to take advantage of short term volatility in order to make a quick profit. In these cases, volatility would not be negatively related to the development of a stock market (despite of the consequences for the economy). In Chile however, whose market has been rather stable during the last twenty years, most investors were in for the long term (because of the economy's recovery), but there was also hesitation to enter the market because as any emerging market the risk was rather high. Since the stock market was shielded from the world economy, any excessive volatility would make investors nervous because it would signal economic problems. That is a likely explanation of the significance of the volatility variable in the Chilean model. In Mexico, on the other hand, volatility is not significant. This is probably connected to the fact that the Mexican stock market is affected by factors not directly related to its economy (as discussed above). Considering also that the Mexican economy had several ups and downs during our sample period, it is only reasonable to assume that investors were expecting short term volatility and it did not influence their long term investment decisions.

Our results do not reject the proposition that the real economy and the financial sectors can cause each other to grow, although we have failed to find strong evidence of that happening. In the Asian countries, the results support the liberalisation thesis. Financial depression has isolated the financial sectors from the economy and made them unproductive. Of course, this does not mean that if reforms are implemented the financial sector will definitely become productive. They indicate however, that change is needed. Our findings for the Asian countries justify Shaw's argument that the initial step towards development is financial deepening. First the government can liberalise the economy and let interest rates reach their equilibrium level, and then start thinking about the creation of a stock market. In a distorted economic environment, a stock exchange can only prove costly without actually contributing to the economic development of the country. As far as the banking sector is concerned, the results also justify the liberalisation thesis. The banking sector (state led and depressed) has failed to contribute to the economic development of the Asian countries in our sample. Only in South Korea, it was found to be effective, but at a huge cost which was revealed in the 1997 crisis. Otherwise, as a result of subsidised loans to favoured industries, interest ceilings and restrictions in the economy, the banking sector in these countries remained underdeveloped and failed to fulfil its role as a provider of finance for companies and a monitoring body of companies' performance.

For the two Latin American countries of our sample, the picture is completely different. The stock market is beneficial to both economies and our results support the endogenous growth scenario given by Boyd and Smith. This is evidence in favour of liberalisation. With respect to the banking sector, however, the results show the need for tight government regulation. It is interesting to see that when left to self regulation, it is the banking sector and not the stock market that is prone to crashes. However, the differences between the results of the two countries suggest that certain restrictions may be beneficial to an economy. More specifically, placing restrictions on short term capital movement has proved a source of stability for the Chilean economy; something that the Mexican economy has not experienced in the last twenty years. A problem with these restrictions could be that Chile attracted less foreign investment than it would have, had it completely liberalised capital movement. The question is therefore, how beneficial and how desirable



short term capital is. Based on the results presented here, we feel that short term capital can be damaging. When an economy is growing, it is expected that it will encounter certain difficulties. Having to deal with capital flight can only add to problems, which may be only temporary. By restricting short term capital movement, Chile effectively invited only investors with a long term view. This has served well in not destabilising the economy and making the stock market an effective pricing mechanism, as it is implied by the third equation for Chile.

Our results also demonstrate the problems inherent in cross country regressions. We believe that by aggregating the data, researchers lose a lot of information which is of paramount importance in this kind of studies. Our results agree with most researchers results that financial development can lead to economic growth<sup>2</sup>. However, by examining every country individually and taking into account the special features of each country when interpreting the results, we see that this does not apply to all countries. We feel that more important than determining if financial development can help economic development is to establish the *conditions* under which this can happen. This is impossible to do using cross country regressions and our results justify researchers such as Arestis and Demetriades (1997) who argue that time series analysis may be more appropriate in examining this issue.

On the whole, our results suggest that the endogenous growth model of Boyd and Smith can take place on certain conditions. It can be beneficial to let the financial sectors free to assign prices and interest rates based on market forces. Then they can fulfil their purpose and assist economic development. The evidence presented here, suggest that this is true for countries where the government does not interfere with the pricing and allocation of capital (at least not very much). It should however, act as a monitoring body, regulating these industries and preventing them from taking excessive risk or adopting bad practices. If the government fails to do so, it could cause a major crisis, as the one experienced by the Latin American countries.

---

<sup>2</sup> For references see chapter 4.

#### 6.4. Summary and Conclusions

In this chapter we examined the relationship between the financial and the real sectors of the economy. Our results offer some interesting insights into the scope for stock market development in emerging economies. From the five countries of our sample, in three the stock market is significant and positively correlated with the real economy, namely in Chile, Mexico and South Korea. The two Latin American countries are the most liberalised in our sample. They have both pursued liberal economic policies and opened up their economies to foreign investment to a much higher degree than the Asian countries in our sample. What is important is that in both countries, government intervention in the market place was steadily reduced and both countries' governments were committed to financial liberalisation. The results show us that in such an environment the stock market can play a positive role in the growth of the economy. However, the banking sector is negatively related to the real economy which reflects the banking crisis in these countries during the early 1980s.

In India and in Taiwan we failed to find a positive relationship between the stock market and the economy. In India the stock market development variable is insignificant and in Taiwan it is exogenous and negatively correlated with the real economy. These results seem to suggest that the development of the stock market was not beneficial to the growth of these countries. It could be construed as evidence either against financial repression or against the development of a stock market in a financially repressed system.

In South Korea, both the banking sector and the stock market are positively related to economic growth and are exogenous. This reflects the role of the government in managing the economy. Since the financial sector is not free to develop it could not grow with the economy. However, we see that even in a financially repressed environment the stock market can be a source of growth if it is appropriately managed.

The evidence on the effect of stock market volatility on the economy is not clear. The volatility variable is significant only in Chile and Taiwan. In Chile it is negatively related to the economy, while in Taiwan it is positively related to the economy. On the whole,

the results do not support the Keynesian argument that stock market volatility affect negatively economic growth. However, even if it can affect it is not obvious whether stock market volatility increased after liberalisation. If it did not, it could be the case that the level of volatility in the sample countries is low and therefore, harmless. We should examine then if volatility increased after stock market liberalisation or not which is the subject of the next chapter.



## **CHAPTER 7: EMPIRICAL ANALYSIS OF STOCK MARKET**

### **VOLATILITY BEFORE AND AFTER LIBERALISATION**

#### **7.1. Introduction**

Our results so far indicate that the stock market can be a source of growth under certain conditions. In the last chapter we saw that in Chile, Mexico and South Korea the stock market was positively related to the real economy. We also saw that the volatility variable was significant and positively related to the economy only in Chile. This can be seen as evidence against the Keynesian criticism on the development of the stock market in these countries. It seems that stock market volatility was not a problem in the development of the countries in our sample. The question is: does stock market volatility not affect economic growth in general, or did stock market volatility in these countries fall following liberalisation and could not therefore harm the economy? Both of these arguments run against the Keynesian theory which claims that stock market volatility should increase as a result of stock market development and it should prove harmful to the economy. In view of the results in the previous chapter, the question becomes: did stock market volatility increase following liberalisation or not? Examining this question is interesting because it should help us understand the effect of liberalisation on stock market development.

We attempt to provide an answer to this question using the methodology outlined in chapter 5. Specifically we utilise a GARCH and an EGARCH process to examine how the nature of volatility changed after the most important liberalisation policies were implemented in our sample countries. The reason we use the GARCH process to capture volatility is because it has been empirically found to be a very effective tool for capturing volatility. Several studies show how a GARCH (1,1) process can successfully model the volatility of most financial time series<sup>1</sup>. The one feature that cannot be captured by a GARCH process is the asymmetry between volatility caused by positive and negative

---

<sup>1</sup> For references see chapters 4 and 5.

news. For this reason we utilise the EGARCH process which can successfully account for this effect.

## **7.2. Results from the GARCH estimation**

Following the methodology outlined in chapter 5, we obtain the unpredictable part of the stock returns by employing a procedure similar to Pagan and Schwert (1990), as discussed above. More specifically, Table 7.1 reports the results from regressing returns on a constant and four dummy variables (covering from Tuesday to Friday), and Table 7.2 reports the results from regressing the residuals from this regression on its lagged values. The results presented in these tables have implications for the informational efficiency of the sample stock markets. A market is said to be informationally efficient when it is not possible to consistently generate abnormal returns. There are three degrees of efficiency [Fama, (1965)]: weak form efficiency, which implies that prices follow a random walk; semi-strong form efficiency, which implies that all public information is incorporated in stock prices when it becomes available; and strong form efficiency, which implies that all private information is incorporated in stock prices. For a market to be efficient in the weak sense, prices must not exhibit any trends. However, recent studies have suggested daily effects in stock returns which are not consistent with the efficient market hypothesis. More specifically, an anomaly known as the Monday effect has been documented by several researchers [Aggarwal and Rivoli (1989), Garrett and Spyrou (1998) and Lee et. al. (1990)]. The Monday effect suggests that returns on Mondays are lower, while returns on Fridays are higher.

From Table 7.1 we can see that for all markets except India and Taiwan, the sign of the coefficient of the constant is negative, while the sign of the coefficient of the Friday dummy is positive for all markets except Taiwan. Although most of the coefficients are not significant, these results may suggest a Monday effect, consistent with the previous empirical findings mentioned above. This is especially true for Mexico, where all days except for Monday show a significant positive return, while the sign of the Monday coefficient is negative, but significant only at the 10% level. Returns on Fridays are higher in Chile, Mexico and Philippines. The Monday effect is extended on Tuesdays in India, Korea and Philippines, which is in line with Aggarwal and Rivoli (1989) findings.

The only exception is Taiwan, where returns on Tuesdays are indeed lower than the other days of the week, but Monday returns are the highest in the week.

The adjustment for serial correlation in Table 7.2, confirms that none of the countries is efficient since for all of them there are significant lag returns. The least inefficient are South Korea and Philippines, where only the first lag is significant. The least efficient is Pakistan where every lagged return up to the fourth is significant, with the first, second and fourth lag being significant at the 1% level. This indicates that the Karachi stock market has a long memory from which abnormal returns can be generated. Such behaviour is contrary to the weak form efficiency and there are several possible explanations for it (e.g. infrequent trading, illiquidity). From the other markets, the Chilean and the Indian exhibit first and fourth order serial correlation (the fourth lag is significant at the 5% level, but not at the 1% level). The other three markets (Argentina, Mexico and Taiwan) also exhibit serial correlation with order higher than one. However, the investigation of the efficient market hypothesis for the sample markets is beyond the scope of this chapter, thus, no further tests are employed to test this hypothesis.



Table 7.1

Adjustment procedure for the day-of-the-week effect.

$$x_t = c + b_1 D_{Tue} + b_2 D_{Wed} + b_3 D_{Thu} + b_4 D_{Fri} + u_t$$

	$c$	$D_{Tue}$	$D_{Wed}$	$D_{Thu}$	$D_{Fri}$
Argentina	-0.703E-3 (0.0016)	0.0049** (0.0023)	0.0103*** (0.0023)	0.0049** (0.0023)	0.0024 (0.0023)
Chile	-0.332E-3 (0.40E-3)	0.0010* (0.57E-3)	0.0013** (0.57E-3)	0.0016** (0.57E-3)	0.0026*** (0.57E-3)
India	0.424E-3 (0.74E-3)	-0.162E-3 (0.0011)	-0.314E-3 (0.0011)	-0.634E-4 (0.0011)	0.0014 (0.0011)
Korea	-0.257E-3 (0.68E-3)	-0.228E-3 (0.96E-3)	0.711E-3 (0.96E-3)	0.176E-3 (0.96E-3)	0.682E-3 (0.96E-3)
Mexico	-0.0013* (0.73E-3)	0.0026** (0.0010)	0.0027** (0.0010)	0.0044*** (0.0010)	0.0041*** (0.0010)
Pakistan	-0.872E-3 (0.58E-3)	0.0025** (0.82E-3)	0.0022** (0.82E-3)	0.0020** (0.82E-3)	0.260E-5 (0.82E-3)
Philippines	-0.838E-3 (0.70E-3)	-0.131E-3 (0.98E-3)	0.0020** (0.98E-3)	0.0015 (0.98E-3)	0.0028** (0.98E-3)
Taiwan	0.0021** (0.93E-3)	-0.0034** (0.0013)	-0.0018 (0.0013)	-0.0018 (0.0013)	-0.827E-3 (0.0013)

Notes to Table 7.1.

\*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% levels respectively.  
Figures in parentheses are standard errors.

Table 7.2

Adjustment procedure to remove autocorrelation.

$$u_t = c + d_1 u_{t-1} + d_2 u_{t-2} + d_3 u_{t-3} + d_4 u_{t-4} + d_5 u_{t-5} + \varepsilon_t$$

	$c$	$u_{t-1}$	$u_{t-2}$	$u_{t-3}$	$u_{t-4}$	$u_{t-5}$
Argentina	0.54E-4	0.130***	-0.046**	0.097***	0.017	0.020
	(0.73E-3)	(0.0194)	(0.0196)	(0.0195)	(0.0196)	(0.0194)
Chile	-0.16E-4	0.287***	0.019	-0.017	0.042**	0.026
	(0.17E-3)	(0.0194)	(0.0202)	(0.0202)	(0.0202)	(0.0194)
India	0.488E-5	0.142***	0.0068	0.0045	0.0436**	0.0098
	(0.33E-3)	(0.0211)	(0.0213)	(0.0213)	(0.0213)	(0.0211)
Korea	-0.134E-4	0.0498**	-0.0033	0.0055	-0.0238	-0.0155
	(0.30E-3)	(0.0195)	(0.0195)	(0.0195)	(0.0195)	(0.0195)
Mexico	0.49E-4	0.236***	-0.056**	0.007	0.074***	-0.014
	(0.31E-3)	(0.0195)	(0.0199)	(0.0200)	(0.0198)	(0.0193)
Pakistan	-0.146E-4	0.137***	0.0559**	0.0504**	0.094***	0.0053
	(0.25E-3)	(0.0211)	(0.0212)	(0.0212)	(0.0212)	(0.0211)
Philippines	-0.552E-5	0.228***	-0.0215	0.0077	0.0275	-0.0132
	(0.30E-3)	(0.0195)	(0.0200)	(0.0200)	(0.0200)	(0.0195)
Taiwan	-0.126E-4	0.0626**	0.0615**	0.0348*	-0.74E-3	-0.0215
	((0.42E-3)	(0.0195)	(0.0195)	(0.0195)	(0.0195)	(0.0195)

Notes to Table 7.2.

$u_t$  are the residuals from the day-of-the-week adjustment procedure, see Table 5.2.

\*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% levels respectively.

Figures in parentheses are standard errors.

**Table 7.3**  
Basic statistics for the unpredictable returns.

	Max	Min	StDev	Skew	Kurt	Norm	Ljung-Box(5) St
Argentina	0.364	-0.652	0.038	-0.513	41.884	193,374.9	0.306
Chile	0.060	-0.124	0.009	-0.587	18.559	38,096.8	0.257
India	0.165	-0.091	0.016	0.755	12.784	15,570.0	0.082
Korea	0.100	-0.118	0.016	0.196	5.775	3,691.1	0.027
Mexico	0.143	-0.138	0.016	0.201	8.952	8,846.6	0.196
Pakistan	0.070	-0.097	0.012	0.019	6.464	3,926.4	0.056
Philippines	0.097	-0.096	0.016	0.044	4.357	2,092.1	0.222
Taiwan	0.130	-0.103	0.021	-0.078	2.768	846.61	0.029

*Notes to Table 7.3.*

The statistics are: max: maximum return, min: minimum return, StDev: standard deviation, skew: skewness, kurt: kurtosis, norm: normality (Jarque-Bera test) and the Ljung-Box (5) statistic for serial correlation.

Table 7.3 presents some sample statistics for the unpredictable returns of the sample countries (figures 7.7-7.14). Argentina shows the most extreme maximum and minimum unpredictable returns. It is also the most risky market with the highest standard deviation. The results for skewness vary with some of the countries displaying skewness to the right and other to the left. However, skewness does not seem to be a big problem since all statistics are close to 0. Excess positive kurtosis is found for all countries indicating thicker tails than a normal distribution. The Jarque-Bera test for normality indicates significant departures from normality for all countries' returns. The Ljung-Box statistic for 5th order autocorrelation is not significant for any country.

The results from testing for ARCH effects in the volatility of returns of the eight emerging markets are reported in Table 7.4 and indicate that there are significant ARCH effects in all countries in both subperiods, except for the pre-liberalisation period in Argentina. Thus, there is evidence of time varying volatility in the sample markets.



Table 7.4

Lagrange Multiplier Statistic for ARCH effects in the Conditional Volatility of adjusted stock price returns in the sample countries

$$h_t^2 = \omega + \sum_{i=1}^q a_i u_{t-i}^2$$

$$H_0: a_1 = \dots = a_q = 0$$

$$H_1: a_1 \neq 0, \dots, a_q \neq 0$$

	$\chi^2 (1)$		$\chi^2 (12)$	
	Pre-liberalisation	Post-liberalisation	Pre-liberalisation	Post-liberalisation
Argentina	0.705 (0.401)	33.64*** (0.000)	7.82 (0.799)	197.64*** (0.000)
Chile	5.776** (0.016)	170.142*** (0.000)	7.863 (0.796)	285.811*** (0.000)
India	6.576*** (0.010)	42.402*** (0.000)	67.652*** (0.000)	78.805*** (0.000)
Korea	95.578*** (0.000)	79.336*** (0.000)	137.007*** (0.000)	378.162*** (0.000)
Mexico	0.284 (0.594)	312.994*** (0.000)	25.040** (0.015)	335.563*** (0.000)
Pakistan	27.586*** (0.000)	60.725*** (0.000)	30.755*** (0.002)	94.596*** (0.000)
Philippines	11.203*** (0.001)	71.868*** (0.000)	73.781*** (0.000)	144.357*** (0.000)
Taiwan	16.653*** (0.000)	20.470*** (0.000)	63.717*** (0.000)	82.672*** (0.000)

Notes to Table 7.4.

The Lagrange Multiplier Statistic is distributed as  $\chi^2 (q)$ .

The null hypothesis is no ARCH effects.

Figures in parentheses are probabilities that the null is accepted.

\*\*\*, \*\* and \* reject the null hypothesis at the 1%, 5% and 10% significance level respectively.

Only  $\chi^2 (1)$  and  $\chi^2 (12)$  tests are reported.

Having established ARCH effects in the volatility of the sample data, we next turn our attention to the existence of GARCH effects. To this end, we estimate a GARCH model for the whole sample period (Table 7.5). Results from the whole sample period show that the ARCH effect is present in all countries. In other words, large (small) price changes follow large (small) price changes of either sign. The ARCH coefficient ( $\alpha$ ) is less than unity in every case indicating that volatility is not explosive. The sum  $\alpha + c$  which measures persistence is significantly different from unity only for Korea, Mexico and Taiwan at the 1% significance level. This suggest that any shock to volatility is permanent in the other five countries. The Ljung-Box tests for serial correlation do not reject the null hypothesis of no autocorrelation, except for a few cases (the statistic rejects for Argentina, Chile and India at the 1% significance level). However, these results should be interpreted with caution because when ARCH is present in a series, the standard tests for autocorrelation tend to over-reject the null [Taylor (1986)].

The next step in the analysis, is to test for structural shifts. Results from these tests are presented in Table 7.6. The dummy variable of the variance equation is significant for Korea and Pakistan only. This implies that the stock markets in India, Philippines and Taiwan did not become more volatile during the crash. Furthermore, none of the Latin American countries seems to be affected by the crash as far as volatility is concerned. The coefficient of the dummy variable for both Korea and Pakistan is positive, suggesting an increase in the conditional variance of stock returns in both countries. We can also find a structural shift in the mean equation for Chile. This indicates a jump in the stock returns process. Since there is a structural shift in the equations of Chile, Korea and Pakistan, the subperiod 1/9/97 to 28/2/98 for these countries is excluded from the analysis that follows.

**Table 7.5**

GARCH(1,1) estimation for daily returns of the eight emerging stock markets for the whole sample period.

$$h_t^2 = \omega + a_1 u_{t-1}^2 + c_1 h_{t-1}^2$$

	$\omega$	$a$	$c$	$a + c$	Ljung-Box St.	Iter
Argentina	0.512E-5*	0.122***	0.883***	1.005[.518]	28.53[.001]	32
	(0.289E-5)	(0.018)	(0.013)			
Chile	0.456E-5*	0.259***	0.709***	0.968[.105]	37.48[.000]	28
	(0.240E-5)	(0.036)	(0.022)			
India	0.301E-5	0.102***	0.894***	0.996[.482]	32.74[.000]	86
	(0.285E-5)	(0.014)	(0.01)			
Korea	0.96E-5***	0.126***	0.830***	0.956[.000]	14.09[.169]	43
	(0.240E-5)	(0.014)	(0.012)			
Mexico	0.16E-4***	0.151***	0.793***	0.944[.000]	6.38[.783]	28
	(0.262E-5)	(0.022)	(0.016)			
Pakistan	0.377E-5	0.147***	0.843***	0.990[.179]	13.87[.179]	128
	(0.264E-5)	(0.019)	(0.014)			
Philippines	0.159E-5	0.058**	0.938***	0.996[.293]	7.84[.645]	252
	(0.654E-5)	(0.023)	(0.020)			
Taiwan	0.557E-5**	0.071***	0.915***	0.986[.000]	16.00[.100]	122
	(0.283E-5)	(0.010)	(0.008)			

*Notes to Table 7.5.*

Numbers in parenthesis are standard errors.

\*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% level respectively.

Numbers in brackets are probabilities that  $\alpha + c$  is not significantly different from unity, given by a Wald test.

Ljung-Box St. is the Ljung-Box (10) statistics for serial correlation.

The last column reports the number of iterations after which convergence was reached.



**Table 7.6**

Tests for structural shift in the unconditional variance and mean of stock returns  
in the sample countries.

$$y_t = \beta_0 + d_1 D_t + \beta_1 y_{t-1} + u_t$$

$$h_t^2 = \omega + d_2 D_t + a u_{t-1}^2 + c h_{t-1}^2$$

$$H_0: d = 0$$

$$H_1: d \neq 0$$

	$d_1$	$d_2$	Iterations
Argentina	0.111E-3 (0.00135)	0.768E-5 (0.110E-4)	39
Chile	-0.00104** (0.526E-3)	0.859E-6 (0.829E-5)	22
India	-0.912E-4 (0.00113)	0.271E-5 (0.966E-5)	27
Korea	-0.00267 (0.00224)	0.48E-4*** (0.122E-4)	27
Mexico	0.164E-3 (0.00124)	0.142E-4 (0.106E-4)	37
Pakistan	-0.294E-3 (0.00123)	0.38E-4*** (0.107E-4)	49
Philippines	-0.457E-4 (0.00177)	0.215E-4 (0.877E-4)	38
Taiwan	-0.368E-3 (0.00160)	0.737E-5 (0.102E-4)	28

*Notes to Table 7.6*

Number in parentheses are standard errors.

\*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% levels respectively.

The last column reports the number of iterations after which convergence was reached.

The sample period is the post liberalisation period for each country.

The subperiod for which a structural shift is examined is 1/9/97 to 28/2/98.

Having determined the appropriate sample period, we now examine which model is the best to describe volatility pre- and post-liberalisation. For each subperiod and country, five models are estimated with different orders, namely: (1,1), (1,2), (2,1), (0,2) and (2,2). Based on the empirical evidence found in the literature, it is unlikely that a 3rd or higher order process is needed to describe volatility, therefore, the higher order process that we test is the second. The results are reported in Tables 7.7 and 7.8. The empty cells in the tables mean that the particular models did not converge. These models are the GARCH(1,2) for Argentina and Mexico, the GARCH(2,2) for Mexico and Taiwan, and the GARCH(0,2) for Chile, during the pre-liberalisation period and the GARCH(1,2) for Philippines during the post-liberalisation period. The results from the other models clearly indicate that a (1,1) process is enough to capture volatility in these markets. This is consistent with the observation by Bollerslev that for most financial series, a GARCH(1,1) process can adequately describe the data.

**Table 7.7**

Equation log likelihood function for different orders of the GARCH process  
for the pre-liberalisation period.

	(1,1)	(1,2)	(2,1)	(0,2)	(2,2)
Argentina	570.5649*		568.2360	558.8974	563.5303
Chile	1,251.9*	1,239.7	1,249.3		1,237.9
India	1,925.8*	1,921.9	1,923.0	1,866.6	1,907.8
Korea	2,465.8*	2,446.3	2,464.2	2,438.6	2,406.8
Mexico	321.3281*		320.8706	313.7061	
Pakistan	825.4169*	814.1875	823.5588	812.6338	813.8404
Philippines	2,187.6*	2,176.6	2,174.1	2,165.6	2,174.4
Taiwan	1,404.5*	1,397.2	1,401.3	1,381.3	

*Notes to Table 7.7.*

The models with the highest values are selected.

\* indicates the highest values

**Table 7.8**

Equation log likelihood function for different orders of the GARCH process  
for the post-liberalisation period.

	(1,1)	(1,2)	(2,1)	(0,2)	(2,2)
Argentina	4,940.5*	4,922.2	4,910.4	4,766.6	4,903.9
Chile	6,614.3*	6,577.0	6,598.2	6,506.0	6,558.1
India	3,684.0*	3,668.1	3,676.3	3,639.7	3,659.7
Korea	3,868.2*	3,865.4	3,862.9	3,836.6	3,853.9
Mexico	6,039.9*	6,011.5	6,026.3	5,977.7	6,005.2
Pakistan	4,681.8*	4,656.3	4,670.9	4,639.3	4,648.8
Philippines	4,372.3*		4,365.3	4,297.7	4,350.3
Taiwan	4,767.1*	4,761.8	4,745.3	4,739.2	4,760.3

*Notes to Table 7.8.*

The models with the highest values are selected.

\* indicates the highest values

The next step in the analysis is to determine which distributional assumption is appropriate for the sample data. All models are estimated assuming a normal distribution and alternatively a  $t$  distribution. Although the results obtained from the two assumptions are similar, in every case both the AIC and the SBC favour the assumption of a  $t$  distribution (Table 7.9). The only exception is the pre-liberalisation period for Taiwan where the model can only be estimated assuming a normal distribution (with a  $t$ -distribution it does not converge). Therefore, the AIC and the SBC assuming a  $t$  distribution cannot be calculated and we accept the assumption of a normal distribution.

Tables 7.10 and 7.11 report the results from the GARCH estimation for the pre- and post-liberalisation period. None of the models seems to be misspecified; the Ljung-Box tests for serial correlation reject the null hypothesis of no autocorrelation only for India and Mexico for the pre-liberalisation period and Chile for the post-liberalisation period at the 5%, but not at the 1% significance level, but these results should be interpreted with caution, as mentioned earlier. Note that, although we could not find any ARCH effects in



the volatility of Argentinean stock returns during the pre-liberalisation period, the ARCH coefficient in the GARCH model is now significant, indicating that the ARCH effect is present.

**Table 7.9**

Selection criteria values for different distributional assumptions for the GARCH models estimated.

		Pre-liberalisation		Post liberalisation	
		Normal	t-distr.	Normal	t-distr.
Argentina	AIC	541.7379	557.3095*	4897.8	4935.1*
	SBC	534.3982	548.1314*	4886.7	4921.2*
Chile	AIC	1190.0	1250.1*	6117.3	6145.5*
	SBC	1182.1	1240.3*	6106.4	6131.8*
India	AIC	1905.2	1945.2*	3634.0	3679.0*
	SBC	1896.2	1933.9*	3623.9	3666.0*
Korea	AIC	2431.1	2460.8*	3849.8	3863.2*
	SBC	2421.6	2449.0*	3839.5	3850.3*
Mexico	AIC	309.1702	315.3677*	5956.3	6034.4*
	SBC	303.3448	308.0496*	5944.9	6020.3*
Pakistan	AIC	805.5275	820.4169*	4601.6	4676.8*
	SBC	798.8333	812.0491*	4591.0	4663.4*
Philippines	AIC	2131.8	2182.6*	4319.6	4367.3*
	SBC	2122.5	2171.0*	4309.0	4354.1*
Taiwan	AIC	1400.5		4661.6	4762.1*
	SBC	1391.8		4650.8	4748.5*

*Notes to Table 7.9.*

The first line for every country reports the Akaike Information Criterion and the second line is the Schwarz Bayesian Criterion.

The models with the highest AIC and SBC values are chosen.

\* indicates the highest values.

Comparing the results from the pre-liberalisation and post-liberalisation period, we see that the ARCH effect is statistically insignificant for Mexico and Pakistan in the pre-liberalisation period but becomes significant during the second period. The opposite happens in Philippines where the significant pre-liberalisation ARCH effect becomes insignificant during the second period. Again, the ARCH coefficients for both periods are not unity for any country, indicating non-explosive volatility.

The volatility persistence indicator is higher in the second period for four countries (Chile, Korea, Philippines and Taiwan) and lower for the remaining four. However, the statistical significance tests suggest that except from Mexico, volatility persistence remains the same before and after liberalisation: significantly different from unity for Korea and Taiwan and insignificantly different from unity in every other country. Only in the case of Mexico, the hypothesis that  $\alpha + c$  equals unity, becomes from strongly accepted, strongly rejected. For Korea, although volatility persistence is not permanent in any period, during the post liberalisation period it is higher than in the first period: it increases from 0.80 to 0.931.

So, in terms of volatility persistence, Mexico is the only country which benefited from liberalising its stock market (since any shock to volatility is absorbed by the market at a faster pace than before). What these results mean for Mexico is that, while during the first period a shock to volatility decays at the rate of 0.991 per day, during the second period it decays at the rate of 0.927 per day; after six weeks the proportion of the shock remains at 0.8604 ( $0.991^{30}$ ) during the first period, while it remains at 0.1029 ( $0.927^{30}$ ) during the second period.

**Table 7.10**

GARCH(1,1) estimation for daily returns of the eight emerging stock markets for the pre-liberalisation period.

$$h_t^2 = \omega + a_1 u_{t-1}^2 + c_1 h_{t-1}^2$$

	$\omega$	$a$	$c$	$a + c$	DF	Ljung-Box St.	Iterations
Argentina	0.46E-4*** (0.113E-4)	0.133** (0.054)	0.868*** (0.037)	1.001[.970]	3.64 (1.08)	16.34[.090]	24
Chile	0.23E-4*** (0.575E-5)	0.387** (0.142)	0.480*** (0.082)	0.867[.240]	3.68 (0.64)	17.69[.060]	30
India	0.106E-4 (0.606E-5)	0.112** (0.053)	0.872*** (0.033)	0.984[.688]	3.05 (0.51)	23.19[.010]	38
Korea	0.48E-4*** (0.403E-5)	0.282*** (0.060)	0.512*** (0.047)	0.800[.000]	4.45 (0.76)	11.41[.326]	27
Mexico	0.135E-4 (0.205E-4)	0.145 (0.157)	0.846*** (0.070)	0.991[.939]	3.62 (1.62)	18.38[.049]	27
Pakistan	0.437E-5 (0.870E-5)	0.399 (0.245)	0.577*** (0.100)	0.976[.907]	3.43 (1.03)	15.34[.120]	30
Philippines	0.32E-4*** (0.432E-5)	0.250*** (0.061)	0.700*** (0.039)	0.950[.295]	3.69 (0.54)	10.74[.378]	25
Taiwan	0.39E-4*** (0.589E-5)	0.168** (0.041)	0.753*** (0.032)	0.921[.000]	- -	16.56[.084]	27

*Notes to Table 7.10.*

Numbers in parenthesis are standard errors.

\*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% levels respectively.

Numbers in the brackets are probabilities that  $a + c$  is not significantly different from unity, given by a Wald test.

Ljung-Box St. is the Ljung-Box (10) statistics for serial correlation.

The last column reports the number of iterations after which convergence was reached.



Table 7.11

GARCH(1,1) estimation for daily returns of the eight emerging stock markets for the post-liberalisation period.

$$h_t^2 = \omega + a_1 u_{t-1}^2 + c_1 h_{t-1}^2$$

	$\omega$	$a$	$c$	$a + c$	DF	Ljung-Box St.	Ite r.
Argentina	0.641E-5** (0.314E-5)	0.128*** (0.021)	0.866*** (0.016)	0.994[.441]	7.02 (1.08)	11.57[.353]	24
Chile	0.258E-5 (0.324E-5)	0.204*** (0.038)	0.768*** (0.027)	0.973[.083]	7.41 (1.33)	23.08[.020]	23
India	0.511E-5 (0.509E-5)	0.123** (0.041)	0.854*** (0.029)	0.978[.180]	4.73 (0.83)	14.72[.142]	24
Korea	0.103E-4** (0.401E-5)	0.091*** (0.026)	0.840*** (0.023)	0.931[.000]	8.20 (1.94)	11.16[.345]	20
Mexico	0.19E-4*** (0.273E-5)	0.152*** (0.025)	0.775*** (0.020)	0.927[.000]	5.07 (0.58)	11.87[.294]	34
Pakistan	0.13E-4*** (0.326E-5)	0.222*** (0.047)	0.746*** (0.029)	0.968[.319]	3.66 (0.42)	6.92[.733]	33
Philippines	0.385E-5 (0.940E-5)	0.102 (0.071)	0.885*** (0.055)	0.987[.441]	4.94 (0.89)	7.88[.640]	40
Taiwan	0.94E-5*** (0.321E-5)	0.057*** (0.010)	0.901*** (0.009)	0.966[.000]	- -	13.67[.189]	27

Notes to Table 7.11.

Numbers in parenthesis are standard errors.

\*\*\*, \*\* and \* indicate significance at the 1%, 5% and 10% levels respectively.

Numbers in the brackets are probabilities that  $\alpha + c$  is not significantly different from unity, given by a Wald test.

Ljung-Box St. is the Ljung-Box (10) statistics for serial correlation.

The last column reports the number of iterations after which convergence was reached.

Another interesting finding is that the degrees of freedom increased during the post-liberalisation period for all countries (except Taiwan, where the assumed distribution is normal). This indicates that during the post-liberalisation period the tails of the distribution of the residuals became thinner, indicating less volatility. Another way of measuring volatility persistence is the half life of a shock [Koutmos et al (1994)]. This measurement indicates how many periods it takes for a shock in volatility to reach its half life. This statistic is calculated as:

$$\frac{\log(0.5)}{\log(\alpha + c)}$$

Note that the statistic applies only when volatility is not explosive or permanent, i.e. when  $(\alpha + c) \leq 1$ . If volatility persistence is permanent, then the denominator of the statistic becomes zero and the statistic is not defined; if volatility is explosive, then the denominator of the statistic is a positive number while the nominator is negative and the statistic is meaningless. In the present analysis, volatility is explosive only for Argentina in the pre-liberalisation period, therefore the half life of volatility is not calculated.

For the other countries the statistic is reported in Table 7.12. In four countries, namely Chile, Korea, Philippines and Taiwan, the half life of a shock has increased in the post-liberalisation period, while for three countries it has been reduced (India, Mexico and Pakistan). The most dramatic change occurred in Mexico where the half life of a shock becomes from approximately 76 days in the pre-liberalisation period, only 9 days in the post-liberalisation period. For the other countries the reduction or increase in the half life of a shock is significant, since in most cases the statistic has either more than doubled or halved. The only exception is Pakistan, where the statistic has been reduced for the second period from approximately 29 days to 21 days.

**Table 7.12**

Half life of a shock pre- and post-liberalisation.

The statistic is calculated as:  $\frac{\log(0.5)}{\log(\alpha + c)}$ .

	Pre-liberalisation	Post-liberalisation
Argentina		115
Chile	5	24
India	43	28
Korea	3	10
Mexico	76	9
Pakistan	29	21
Philippines	14	53
Taiwan	9	16

*Notes to Table 7.12.*

The statistics are expressed in days.

All numbers have been rounded to the nearest integer.

Comparing the two coefficients ( $\alpha$  and  $c$ ) before and after liberalisation, we see that in most cases the ARCH coefficient has decreased and the lagged conditional volatility coefficient has increased. More specifically, for Argentina, Chile, Korea, Pakistan, Philippines and Taiwan the ARCH coefficients are lower in the second period and for India and Mexico are higher (the increase is, however, small in both countries). Also, for Chile, Korea, Pakistan, Philippines and Taiwan the lagged conditional volatility coefficients are higher in the second period and for Argentina, India and Mexico are lower. Furthermore, the constant of the variance equation is lower post-liberalisation for five countries (Argentina, Chile, Korea, Philippines and Taiwan) and higher for the remaining three. Table 7.13 reports Wald tests for equality of coefficients for the two periods. The results suggest that at the 5% significance level, the ARCH coefficient ( $\alpha$ ) has changed in five countries only, namely: Chile, Korea, Pakistan, Philippines and Taiwan, and in each one of these countries it has been reduced. Furthermore, the



coefficient of the lagged conditional volatility ( $c$ ) has changed in six countries, namely Chile, Korea, Mexico, Pakistan, Philippines and Taiwan, and with the exception of Mexico, it has increased in every one of these countries. This suggests that the reduction in the ARCH coefficient and the increase in the lagged volatility coefficient is significant.

**Table 7.13**

Wald tests for equality of  $\alpha$  and  $c$  coefficients before and after liberalisation.

	$(\alpha + c)_1 = (\alpha + c)_2$	$\omega_1 = \omega_2$	$\alpha_1 = \alpha_2$	$c_1 = c_2$	$DF_1 = DF_2$
Argentina	1.01[.315]	158.38[.000]	0.72[.788]	0.16[.898]	9.85[.002]
Chile	47.85[.000]	40.79[.000]	23.08[.000]	112.1[.000]	7.89[.005]
India	0.17[.680]	1.12[.290]	0.06[.803]	0.36[.549]	4.09[.043]
Korea	240[.000]	88.28[.000]	55.34[.000]	203[.000]	3.72[.054]
Mexico	23.06[.000]	3.97[.046]	0.81[.776]	12.77[.000]	6.33[.012]
Pakistan	0.07[.795]	6.82[.009]	14.24[.000]	34.28[.000]	0.31[.578]
Philippines	4.34[.037]	8.72[.003]	4.34[.037]	11.19[.001]	1.99[.159]
Taiwan	103[.000]	84.70[.000]	114.9[.000]	4531[.000]	-

*Notes to Table 7.13.*

The Wald test is a chi-square (1) test.

Numbers in brackets are probabilities that the null hypothesis of equality of coefficients is accepted.

The constant of the conditional volatility equation - which is a measure of the unconditional volatility - has changed significantly in all countries except India. With the exception of Mexico and Pakistan, it has been reduced. Changes in the volatility persistence indicator are mixed: for Argentina, India and Pakistan all tests indicate that it remains equal to unity and the same in both subperiods; for Korea and Taiwan it is different from unity and it has increased in the post-liberalisation period, the opposite happens for Mexico, while for Chile and Philippines the tests in Tables 7.10 and 7.11 indicate that it is not statistically different from unity, while the tests in Table 7.13 indicate that volatility persistence changed following liberalisation. The degrees of freedom changed significantly in four countries (for Mexico the hypothesis of equality in the two sub-periods is barely accepted at the 5% significance level). These countries are

Argentina, Chile, India and Mexico and in all these countries the degree of freedom are lower after liberalisation.

The above results present some evidence on how the nature of volatility changed after liberalisation in the markets examined. The Mexican market absorbs shocks to volatility at a faster pace than before. Also, past unexpected news have a lesser impact on volatility than before liberalisation in five countries. This suggest that news in any of these five markets induce a lower level of volatility than before liberalisation. However, the impact of past conditional volatility seems increased in five countries, apart from Mexico where it has been reduced. The past conditional volatility can be interpreted as an infinite order geometrically declining ARCH process. Therefore, this parameter captures the weight of the markets memory. In the five countries where it has been increased, it suggests that older news have an increased effect on volatility after liberalisation, where in Mexico, the reduced coefficient suggests that old news induce less volatility after liberalisation than before. The change in the degrees of freedom suggests that in the countries in which it occurs, volatility has fallen after liberalisation. Higher degrees of freedom mean thinner tails for the distribution of the residuals, which can be interpreted as fewer outliers; thus less volatile returns. The above results suggest that the Mexican market has benefited from liberalising its stock market in terms of lower volatility (note, however, that the constant of the variance equation for this country is higher during the second period, but the increase is small), but for the other six markets the results are not clear.

### 7.3. Results from the news impact curves estimation

Tables 7.14 and 7.15 present the results from the EGARCH equations for the six countries<sup>2</sup> pre and post liberalisation, as well as the unconditional variance for each equation. The parameters of the EGARCH process have changed but not uniformly. It is therefore not possible to make any inferences on whether volatility increased or decreased from these results. Only the change in unconditional variance seems to follow a trend. It has fallen in Argentina, India, South Korea and Taiwan, while it has increased in Pakistan and slightly in Philippines.

**Table 7.14**

EGARCH(1,1) estimation for daily returns for the pre-liberalisation period.

$$\log(h_t) = \omega + \beta \log(h_{t-1}) + \gamma \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + \alpha \left[ \frac{|\varepsilon_{t-1}|}{\sqrt{h_{t-1}}} - \sqrt{\frac{2}{\pi}} \right]$$

	$\omega$	$\beta$	$\gamma$	$\alpha$	Iterations	$\sigma^2$	$m$
Argentina	-0.147 (0.092)	0.975 (0.014)	0.047 (0.034)	0.168 (0.052)	42	2.79E-3	383
India	-0.065 (0.054)	0.991 (0.006)	0.05 (0.018)	0.148 (0.035)	58	1.12E-3	1022
Pakistan	-7.03 (1.837)	0.333 (0.173)	0.004 (0.112)	0.619 (0.17)	108	2.89E-5	10
Philippines	-0.122 (0.082)	0.984 (0.01)	-0.04 (0.017)	0.071 (0.021)	53	4.14E-4	553
S. Korea	-1.15 (0.563)	0.865 (0.065)	-0.084 (0.03)	0.324 (0.061)	40	1.92E-4	70
Taiwan	-1.14 (0.296)	0.854 (0.038)	-0.236 (0.047)	0.204 (0.058)	33	4.78E-4	62

*Notes to Table 7.14:*

- Figures in parentheses are standard errors.
- $\sigma^2$  is the unconditional return variance.
- The last column reports the number of terms used in the product in equation (19) (chapter 4) until convergence was reached.

<sup>2</sup> For Chile and Mexico the estimation procedure did not converge for one of the subperiods. Thus, we exclude the two countries from the analysis.



**Table 7.15**

EGARCH(1,1) estimation for daily returns for the post-liberalisation period.

$$\log(h_t) = \omega + \beta \log(h_{t-1}) + \gamma \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + \alpha \left[ \frac{|\varepsilon_{t-1}|}{\sqrt{h_{t-1}}} - \sqrt{\frac{2}{\pi}} \right]$$

	$\omega$	$\beta$	$\gamma$	$\alpha$	Iterations	$\sigma^2$	$m$
Argentina	-0.183 (0.046)	0.975 (0.006)	-0.046 (0.014)	0.297 (0.028)	52	8.37E-4	406
India	-0.19 (0.075)	0.977 (0.008)	-0.002 (0.014)	0.169 (0.028)	39	2.42E-4	418
Pakistan	-0.516 (0.145)	0.94 (0.016)	0.026 (0.016)	0.269 (0.035)	56	2.14E-4	161
Philippines	-0.138 (0.066)	0.983 (0.008)	-0.053 (0.013)	0.225 (0.035)	41	4.71E-4	562
S. Korea	-0.412 (0.137)	0.953 (0.016)	-0.038 (0.016)	0.169 (0.029)	30	1.7E-4	198
Taiwan	-0.631 (0.231)	0.924 (0.028)	-0.074 (0.024)	0.161 (0.026)	28	2.7E-4	120

*Notes to Table 7.15:*

- Figures in parentheses are standard errors.
- $\sigma^2$  is the unconditional return variance.
- The last column reports the number of terms used in the product in equation (19) (chapter 4) until convergence was reached.



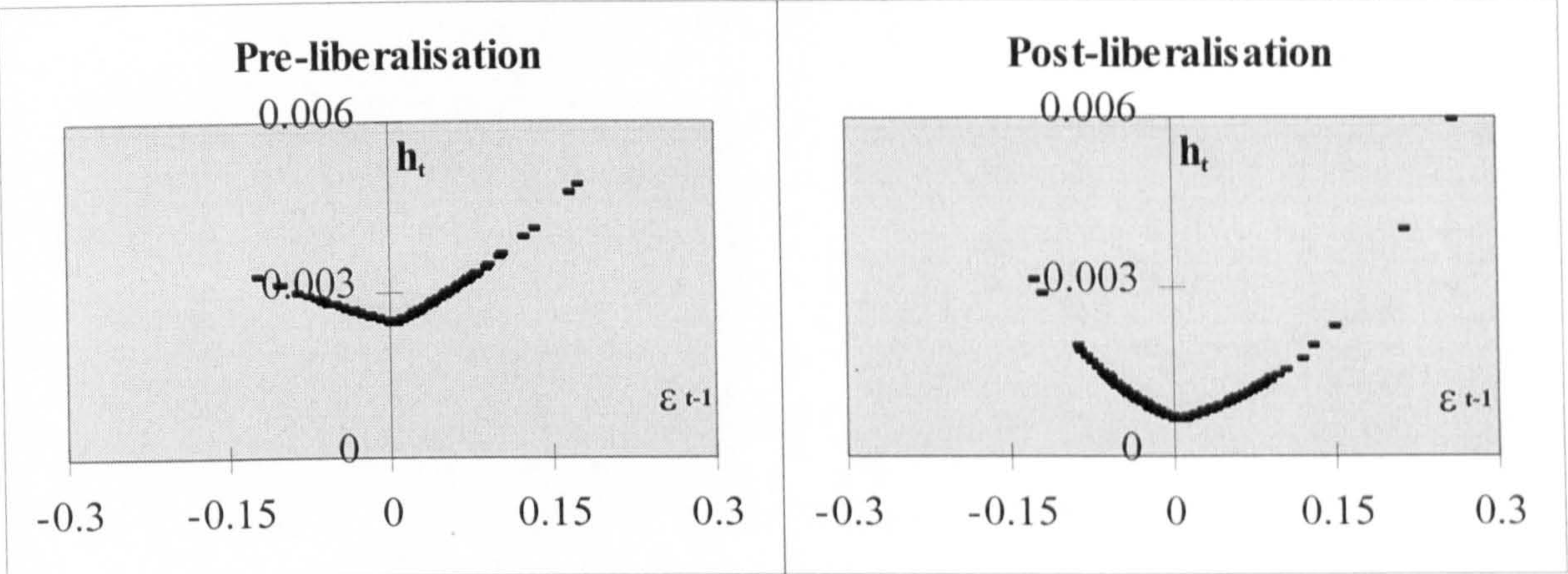


Figure 7.1. News impact curves for Argentina

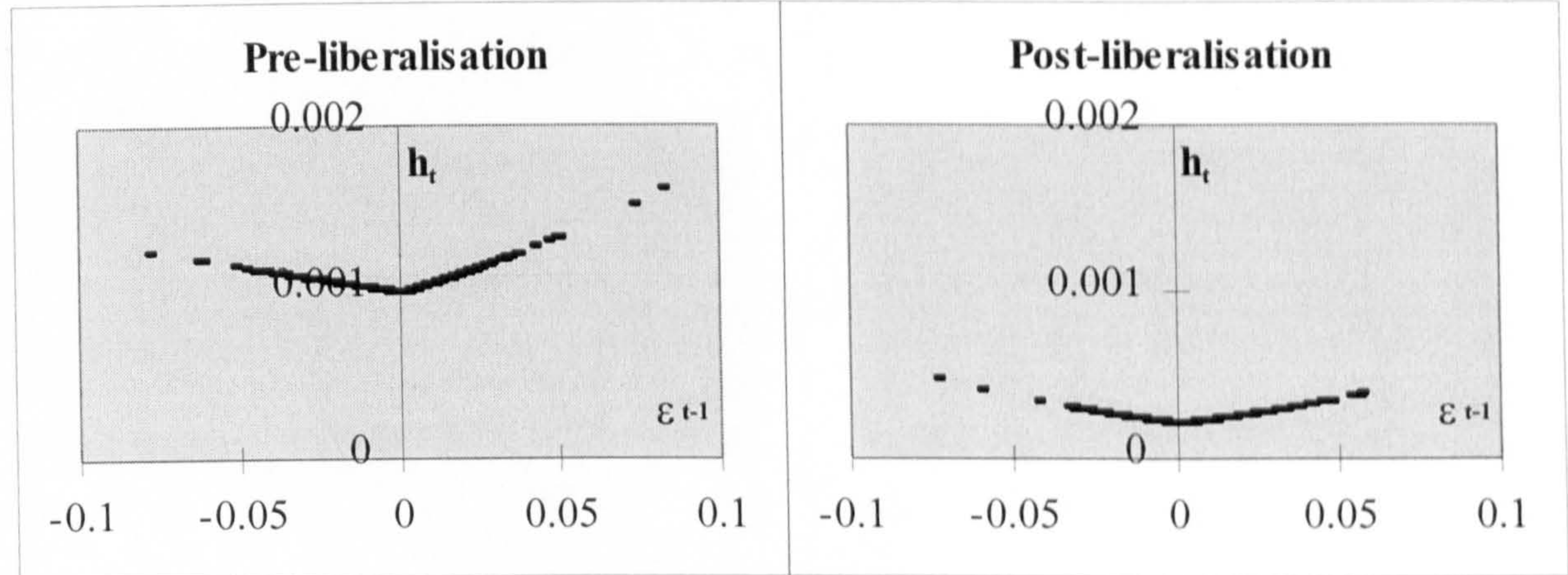


Figure 7.2. News impact curves for India

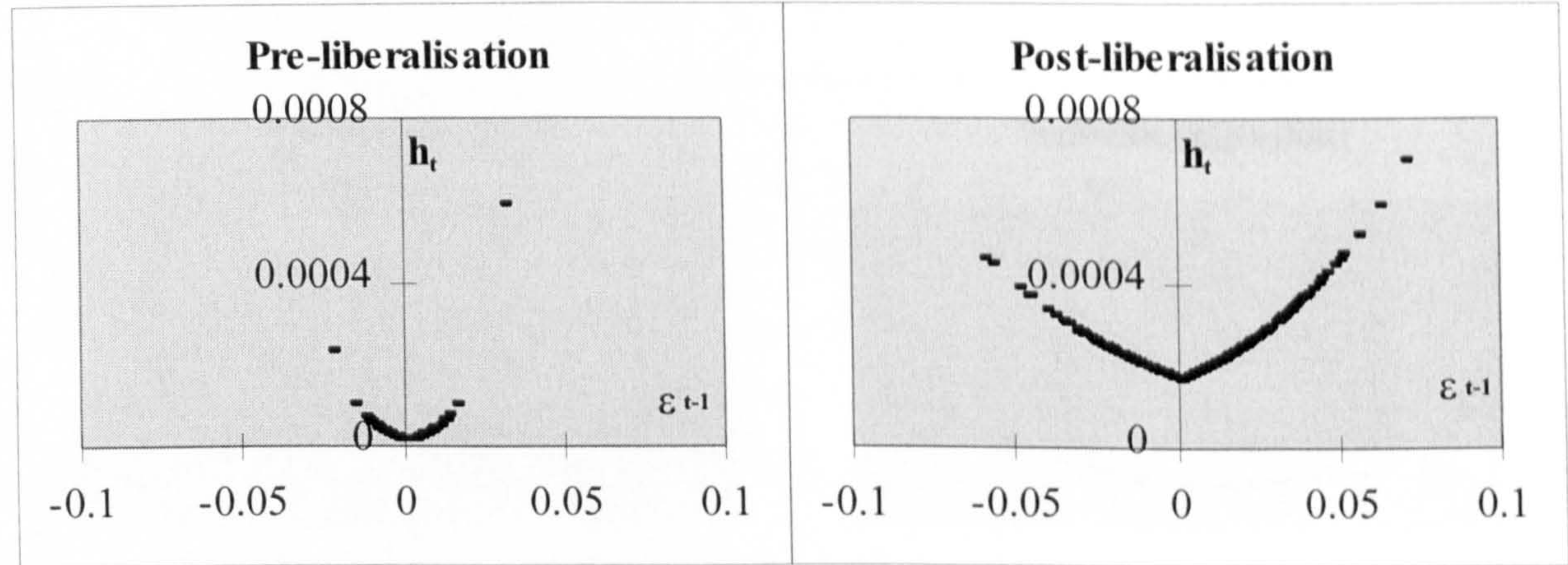


Figure 7.3. News impact curves for Pakistan



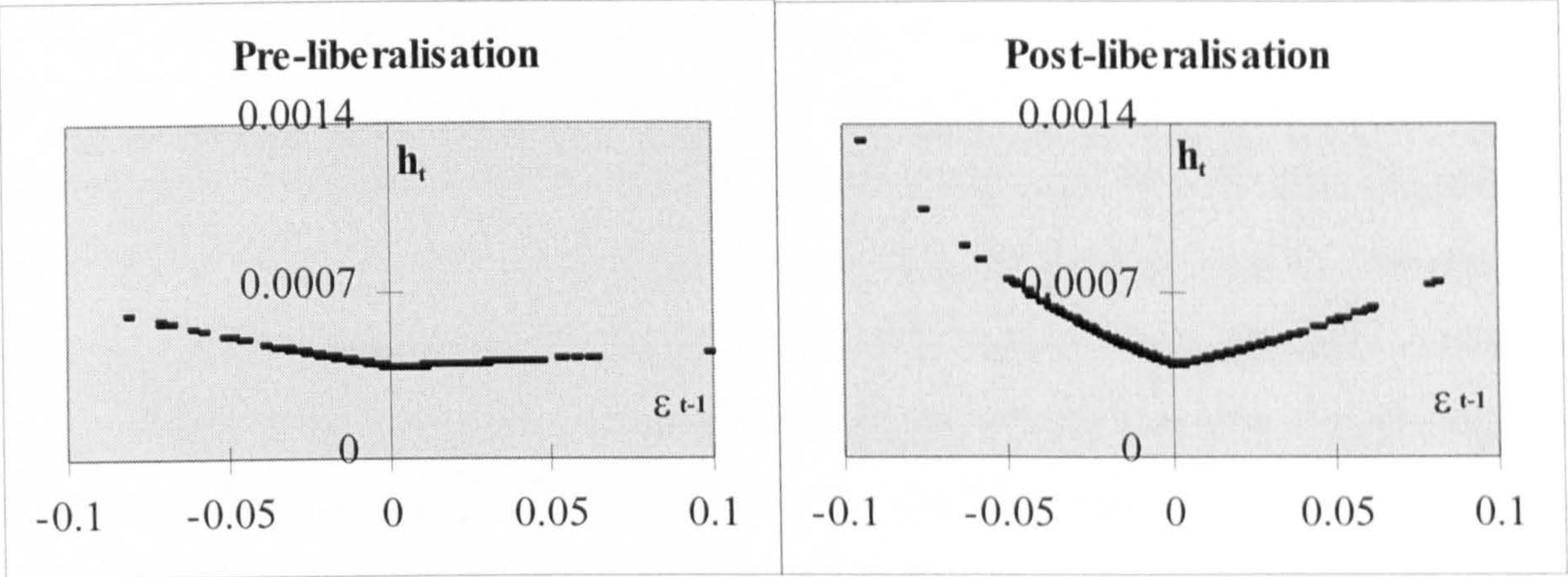


Figure 7.4. News impact curves for Philippines

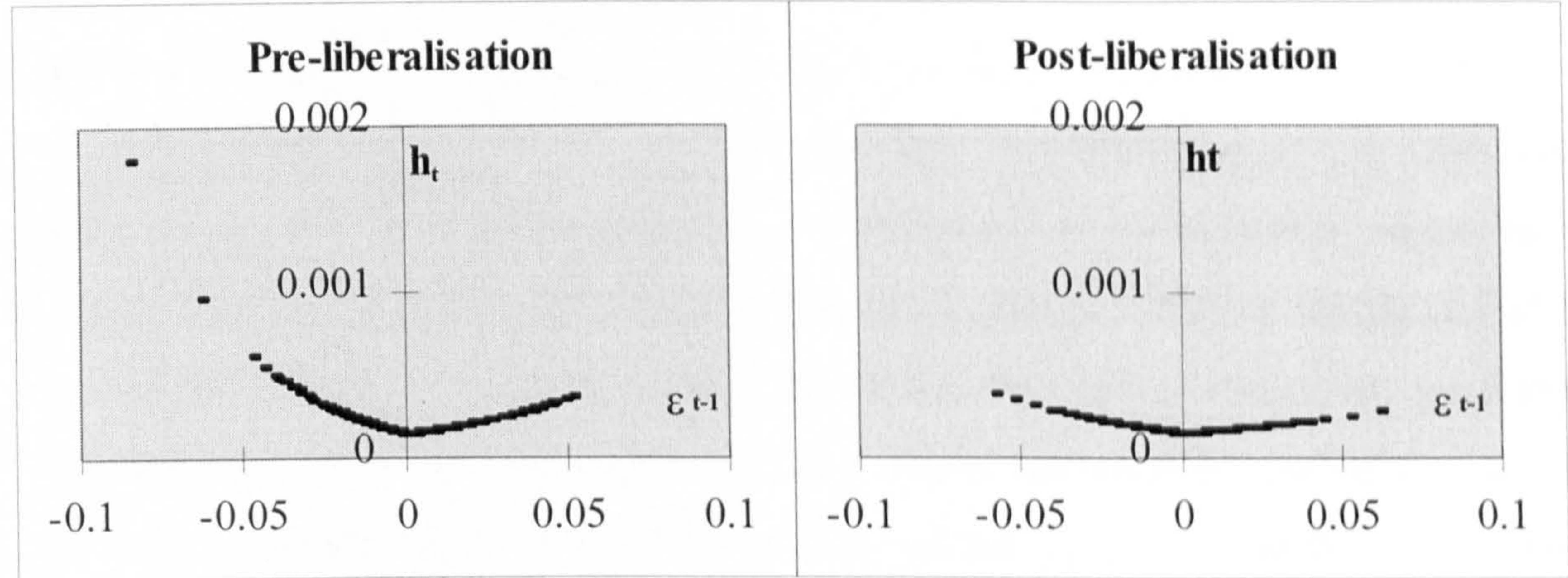


Figure 7.5. News impact curves for South Korea

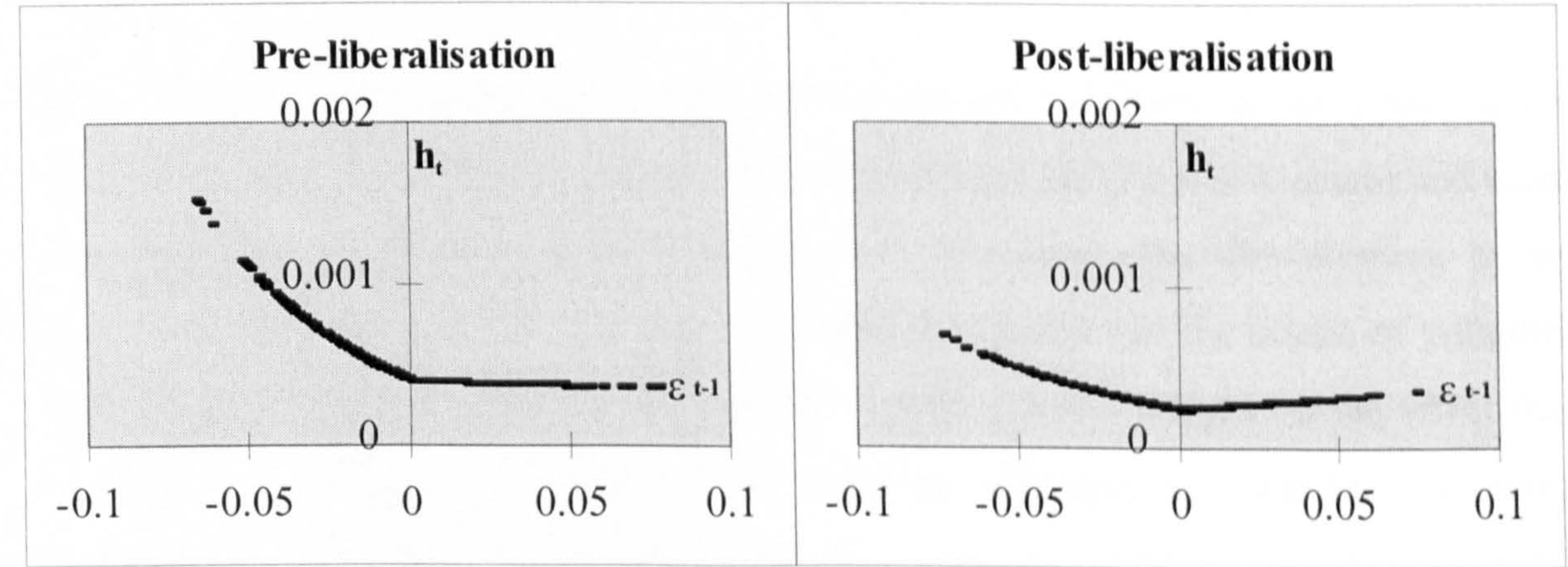


Figure 7.6. News impact curves for Taiwan



Figures 7.1-7.6 present the news impact curves for the sample countries. The vertical axes represent the level of current volatility and the horizontal axes represent the lagged residuals from the EGARCH models. The curves confirm that in most cases ‘good news’ and ‘bad news’ of the same magnitude result in different levels of volatility. However, in the pre-liberalisation period for Argentina and India, it seems that ‘good news’ resulted in more volatility than ‘bad news’ of the same magnitude, which is at odds with the negative relationship between current returns and future volatility observed by Black (1976). In most other cases though, this negative relationship is confirmed. There are several similarities as well as differences among countries. The level of volatility for  $\varepsilon_{t-1} = 0$  has clearly been reduced in only two countries after liberalisation, namely: Argentina and India, and to a lesser extent in Taiwan. In Pakistan volatility increased following liberalisation, while in Philippines and South Korea the curves seem to pass from the same point of the vertical axis for  $\varepsilon_{t-1} = 0$  before and after liberalisation. It is interesting though, to see that in the two sub-periods the parameters of the EGARCH models have changed, which means that news have a different impact on volatility before and after liberalisation. Thus, in India, Pakistan, South Korea and Taiwan the curves are flatter after liberalisation. This means that ‘big news’ cause less volatility during that period than before liberalisation. In Argentina, the shape of the curve is not different in the two sub-periods, while in Philippines the curve is flatter before liberalisation.

#### **7.4. Discussion of empirical results**

In this chapter we examined the impact of financial liberalisation on the stock market volatility of selected emerging markets. Previous research on this area is scarce and tends to concentrate on whether volatility increased or decreased after liberalisation. In the present analysis we take the view that examining the changes in the nature of volatility instead of the level of volatility can provide us with a better insight on the effect that opening up a stock market has on its volatility. Changes in volatility following liberalisation have serious implications for the economic stability and growth of the country undertaking the reform policies. The present analysis serves as a preliminary insight into the subject since financial liberalisation was implemented recently in most of the countries examined and its true effect may take several years to materialise.

The results suggest that the nature of volatility has not changed dramatically after liberalisation. The lag structure of the GARCH process used remains the same in both subperiods, (1,1), indicating that there are no significant changes in the memory of these markets; i.e. old news (two days or older), as expressed by the residuals of the mean equation, do not have a different significance pre- and post-liberalisation for any country. Volatility persistence remains pretty much the same in both subperiods. For Argentina, Chile, India, Pakistan and Philippines an IGARCH process is suggested for both subperiods, indicating that any shocks to volatility are permanent. For Korea and Taiwan the volatility persistence indicator is lower than unity in both subperiods. Only for Mexico does the persistence of shocks to volatility changes dramatically. The parameters of the variance equation for the two periods indicate some trends in the changes of volatility. During the post-liberalisation period the constant is lower for five countries, the ARCH coefficient is significantly lower for five countries and the lagged conditional volatility coefficient is higher for five countries and lower for Mexico. The constant can be interpreted as an indicator of the level of volatility, which has been mainly reduced after liberalisation. The ARCH coefficient expresses the significance of past news on volatility. Since this parameter is lower after liberalisation, we can infer that the markets are becoming less volatile after liberalisation, i.e. news of the same importance induce less volatility in the market post-liberalisation than pre-liberalisation. The reason for this change could be increased liquidity due to the increased numbers of traders in these markets, according to the model presented by Tauchen and Pitts (1983). However, the coefficient of the lagged conditional volatility has increased in most cases, indicating that older news induce proportionately more volatility after liberalisation than before, for which there is no apparent explanation. The only exception to this trend is Mexico, where this parameter is lower after liberalisation, which together with the other results indicate a lower level of volatility for Mexico altogether.

Furthermore, in Argentina and India, past news of every magnitude result in lower levels of volatility, as indicated by the news impact curves. Also, in India the news impact curve is flatter after liberalisation indicating that 'big news' generate less volatility during that period. In South Korea the level of volatility has not changed and in Taiwan it has been

slightly reduced, but in both countries the curves during the second period are flatter suggesting again that 'big news' generate less volatility in that period. The same is also true for Pakistan, although the curve has shifted higher in the second period. This may not be a bad thing since in the pre-liberalisation period the minimum point of the curve is very near zero, which could indicate that during that period the stock market was relatively inactive. Only in Philippines volatility seems to be higher during the second period. Although the curves for both periods have a minimum at the same level on the vertical axis, the curve is flatter during the first period indicating a lower level of volatility during the pre-liberalisation period.

Our results contradict the evidence presented by Aitken (1996) and Grabel (1995) among others, who found that volatility in emerging stock markets increased following liberalisation. While our results do not provide a clear answer as to whether volatility changed after liberalisation, overall the evidence seem to weigh in favour of the liberalisation advocates, especially for Mexico. For the other countries, the increased lagged conditional volatility parameter suggests an increase in volatility, while the rest of the results suggest a decrease. The news impact curves also suggest a decrease in volatility following liberalisation, except for Philippines. On the whole, the above results do not give conclusive evidence as to whether stock market volatility increased after liberalisation or not.

## **7.5. Summary and Conclusions**

In this chapter we examined if the nature of stock market volatility changed after liberalisation in a sample of emerging economies. These are Argentina, Chile, India, Mexico, Pakistan, Philippines, South Korea and Taiwan. We included three more countries in our sample because we only need the stock market index for the present analysis, which is available for more countries. We employed two methodologies, namely a GARCH and an EGARCH process to model volatility in these stock markets. The significant parameters of the models used, indicate that both models perform well in capturing volatility in these markets.



The results from the GARCH process show some uniform changes in the nature of volatility in the countries examined. Specifically, the constant of the process and the ARCH coefficient are statistically lower in five countries, and the lagged conditional volatility coefficient is statistically higher for five countries and lower for Mexico. Also, the degrees of freedom in five countries is lower. Since we examine changes in the *nature* of volatility, we cannot actually claim that volatility increased or decreased after liberalisation. However, the results indicate a lower level of volatility, except for the higher lagged conditional volatility coefficient. The ARCH coefficients suggest that recent past news cause less volatility after liberalisation than before. However, the lagged conditional volatility coefficients suggest that older news cause more volatility after liberalisation than before. This can be attributed to a number of reasons. Incomplete liberalisation could increase volatility as a result of continuing bad practices such as insider trading. Also, it could be that the markets are becoming more inefficient after liberalisation since older news are incorporated slower into prices. The results are open to interpretation because as we have said the drawback of using ARCH-type processes is that they are not supported by theory.

The news impact curves are more informative in that the position and shape of the curves can indicate higher or lower volatility after liberalisation. The results here are not uniform. Only in Argentina and India the level of volatility clearly fell, while in Pakistan it increased. The news impact curves are flatter during the second period for India, South Korea and Taiwan, while it is flatter during the first period only for Philippines.

Overall the results seem to indicate that volatility has actually reduced after liberalisation in most countries of our sample. In any case, it does not seem to have increase. This is consistent with the neo-classical theory which predicts that the riskiness of these markets as represented by their volatility should reduce after liberalisation, reflecting higher stock prices and lower returns. This however, is the case only if the individual national stock markets become more integrated after liberalisation. This is the subject of the next chapter.



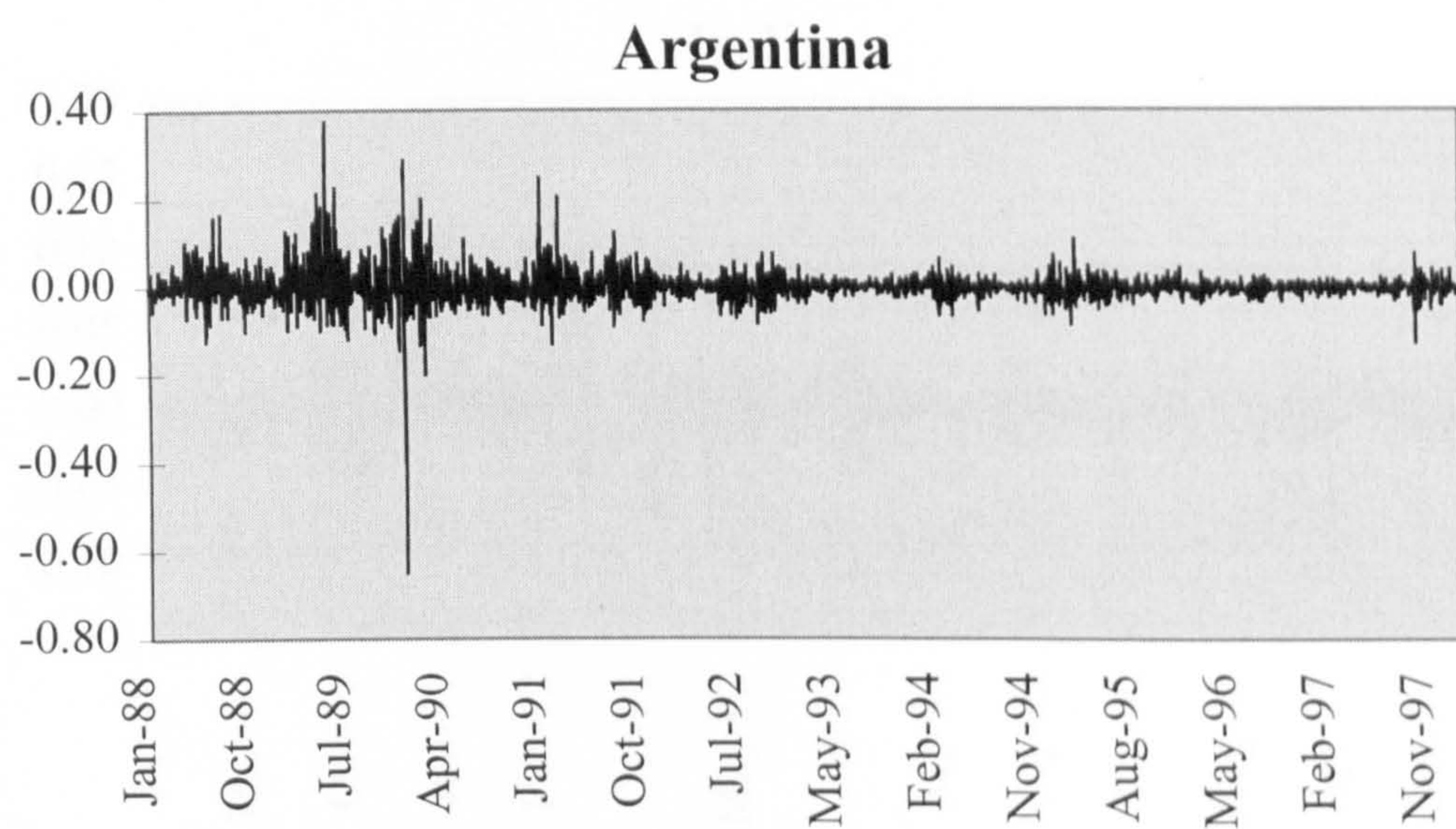


Figure 7.7. Adjusted daily returns of the Argentinean stock market index.

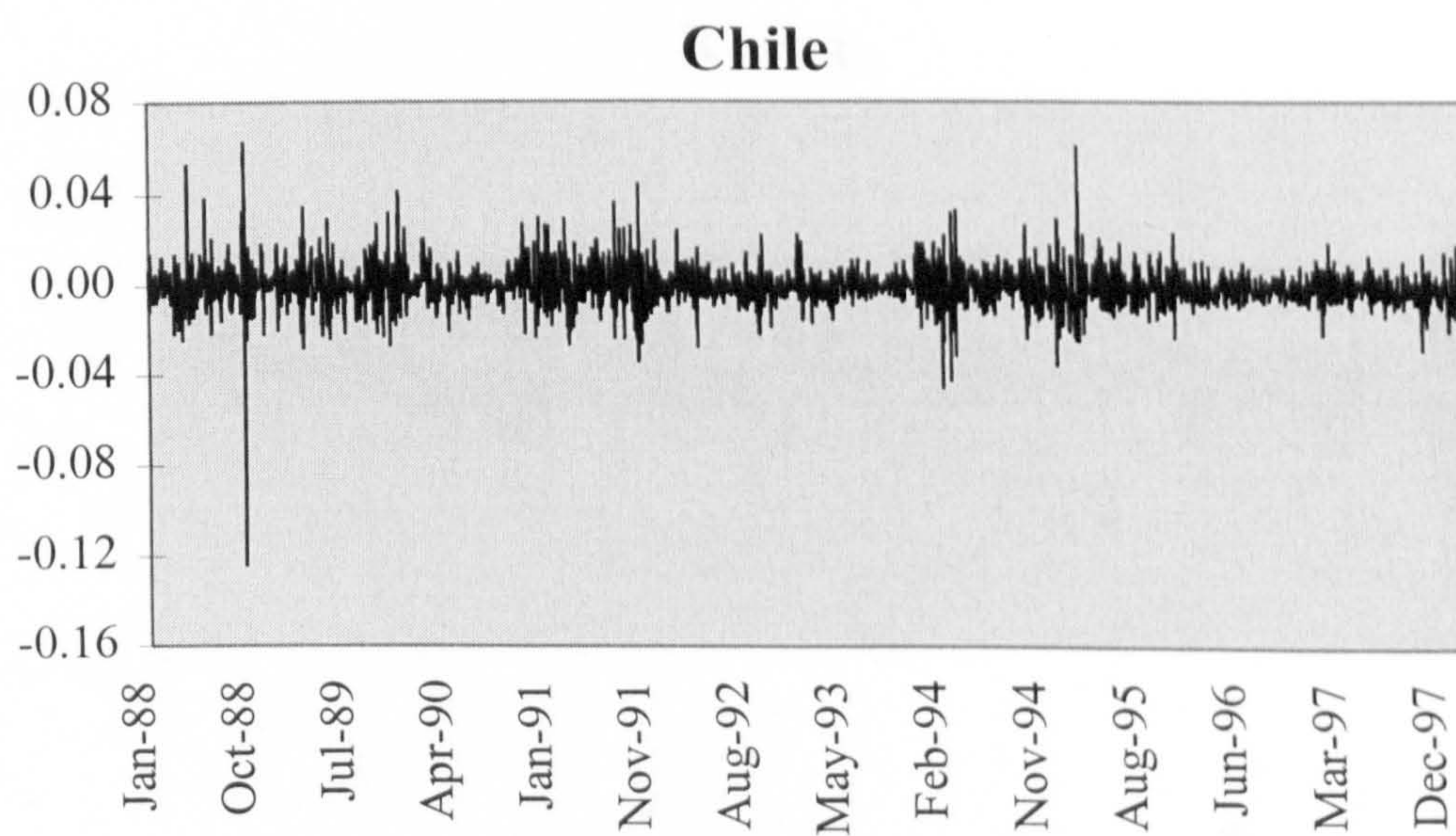


Figure 7.8. Adjusted daily returns of the Chilean stock market index.



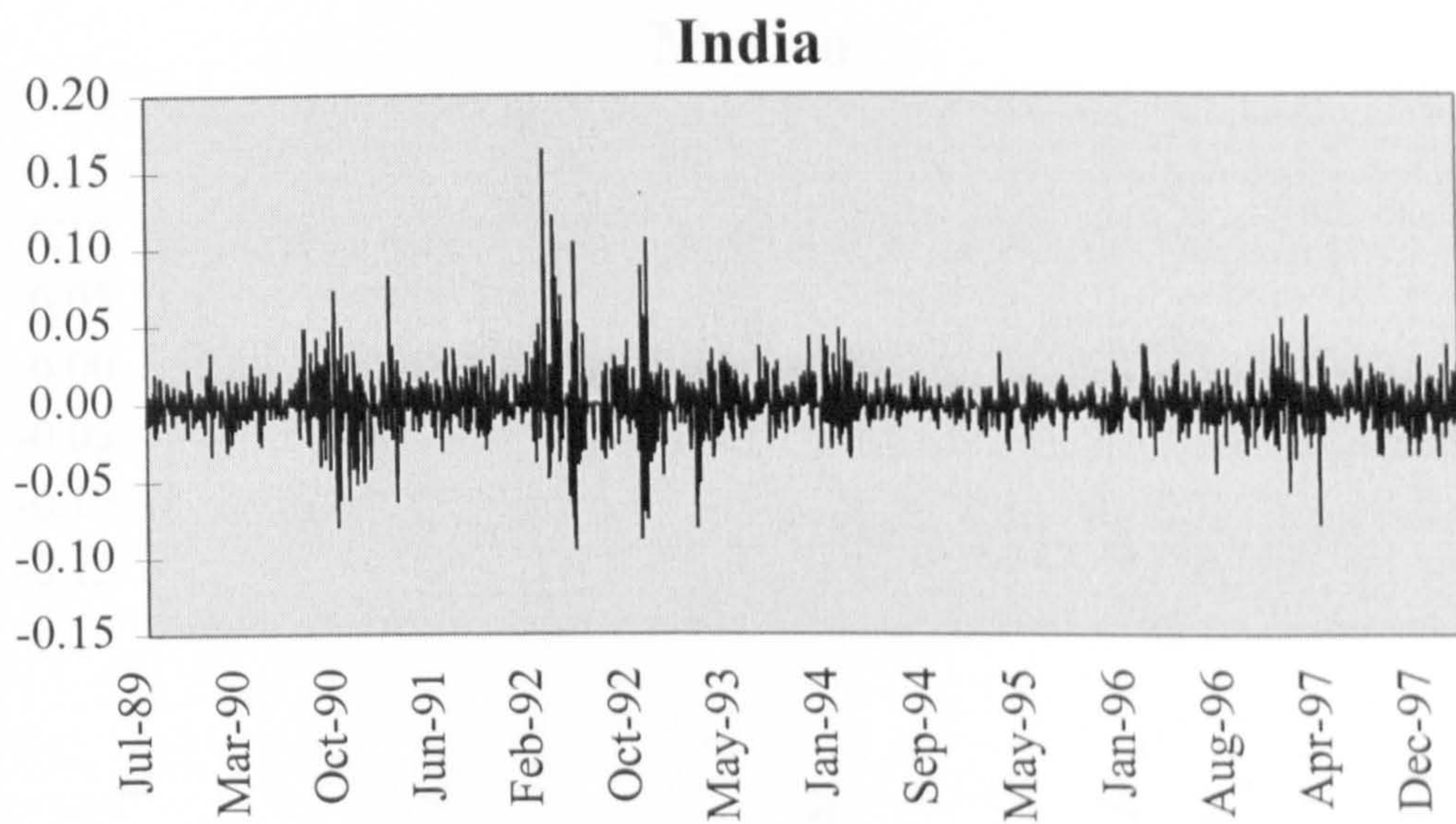


Figure 7.9. Adjusted daily returns of the Indian stock market index.

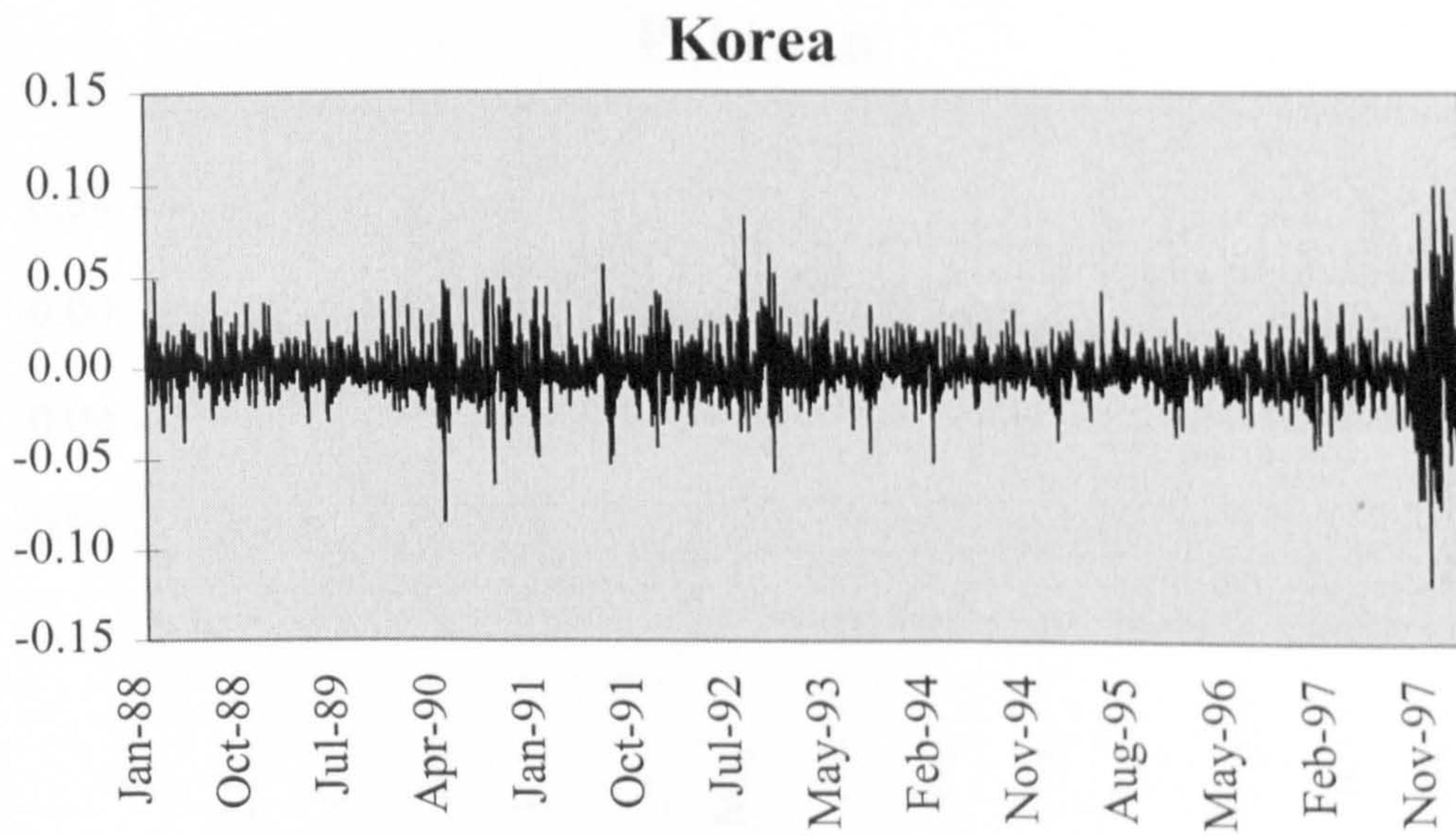


Figure 7.10. Adjusted daily returns of the Korean stock market index.



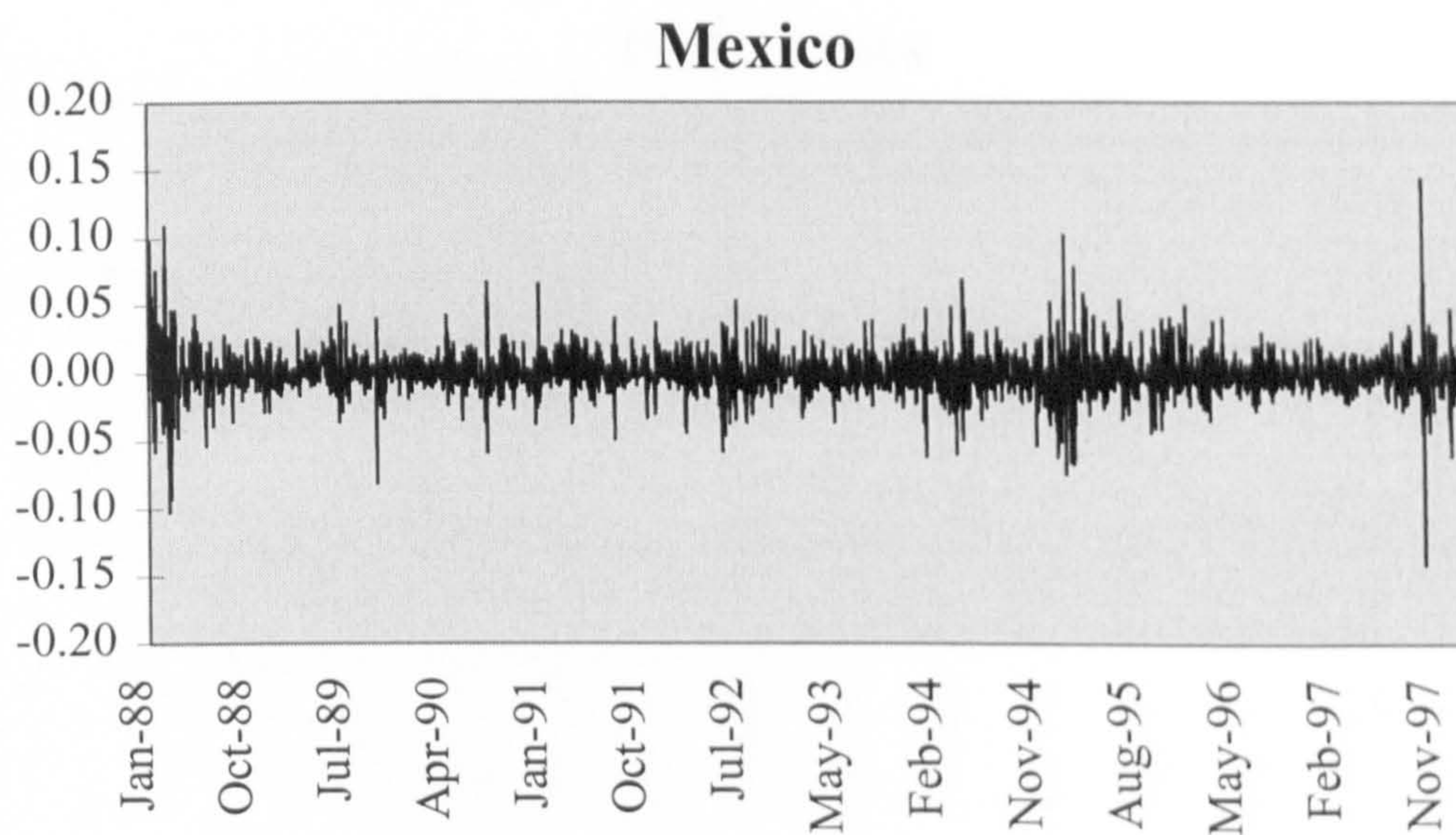


Figure 7.11. Adjusted daily returns of the Mexican stock market index.

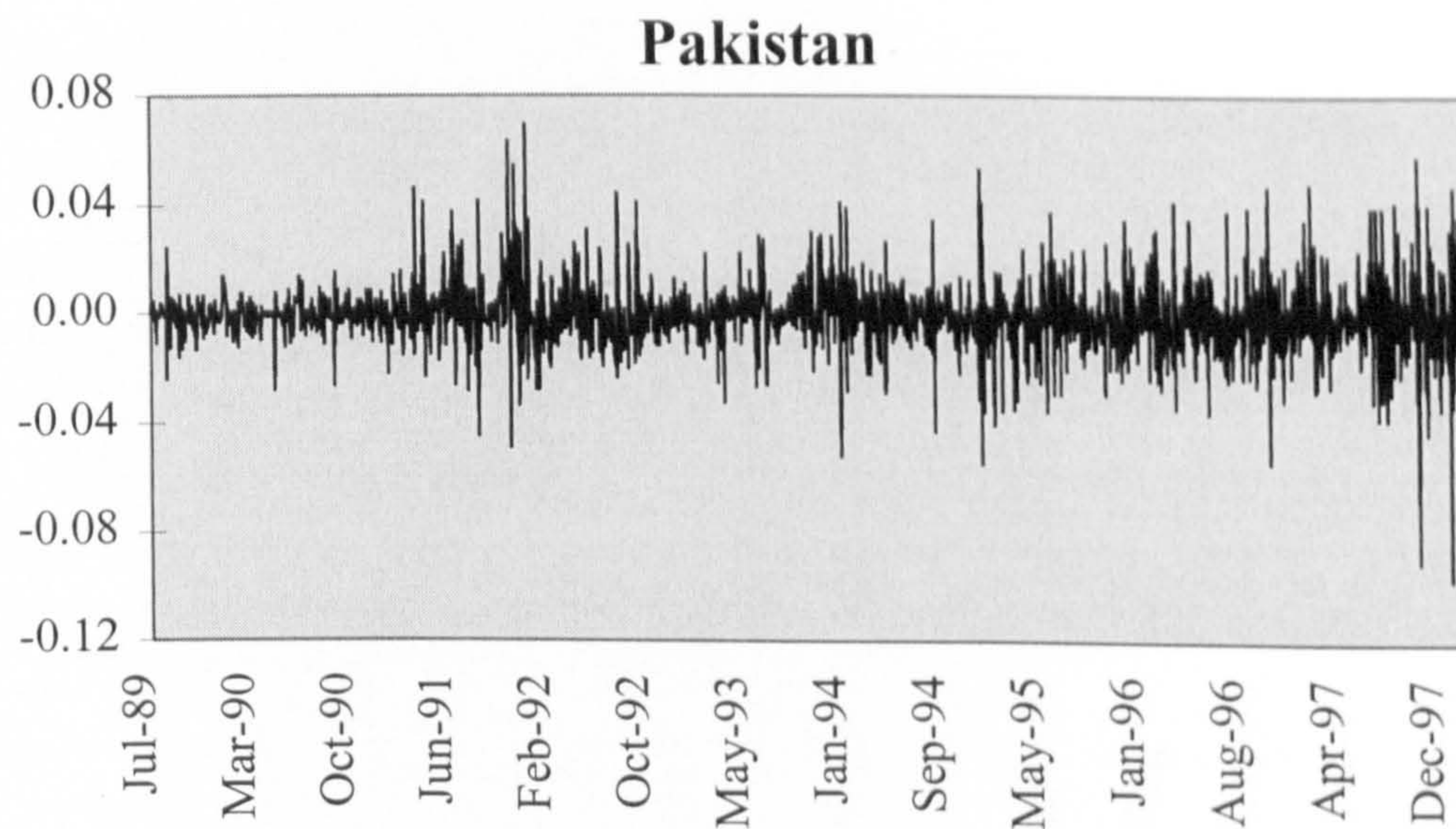


Figure 7.12. Adjusted daily returns of the Pakistani stock market index.



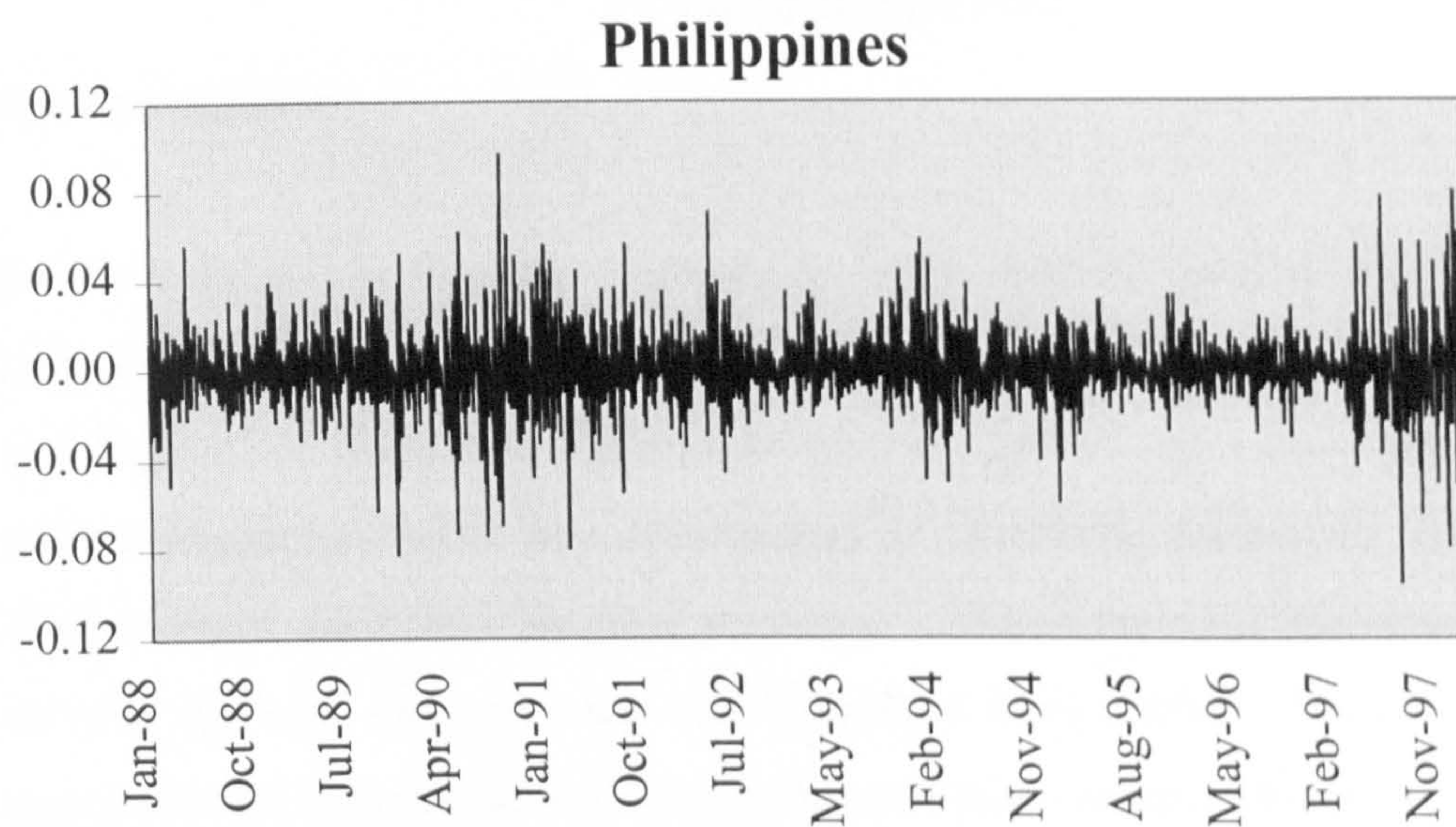


Figure 7.13. Adjusted daily returns of the Philippines stock market index.

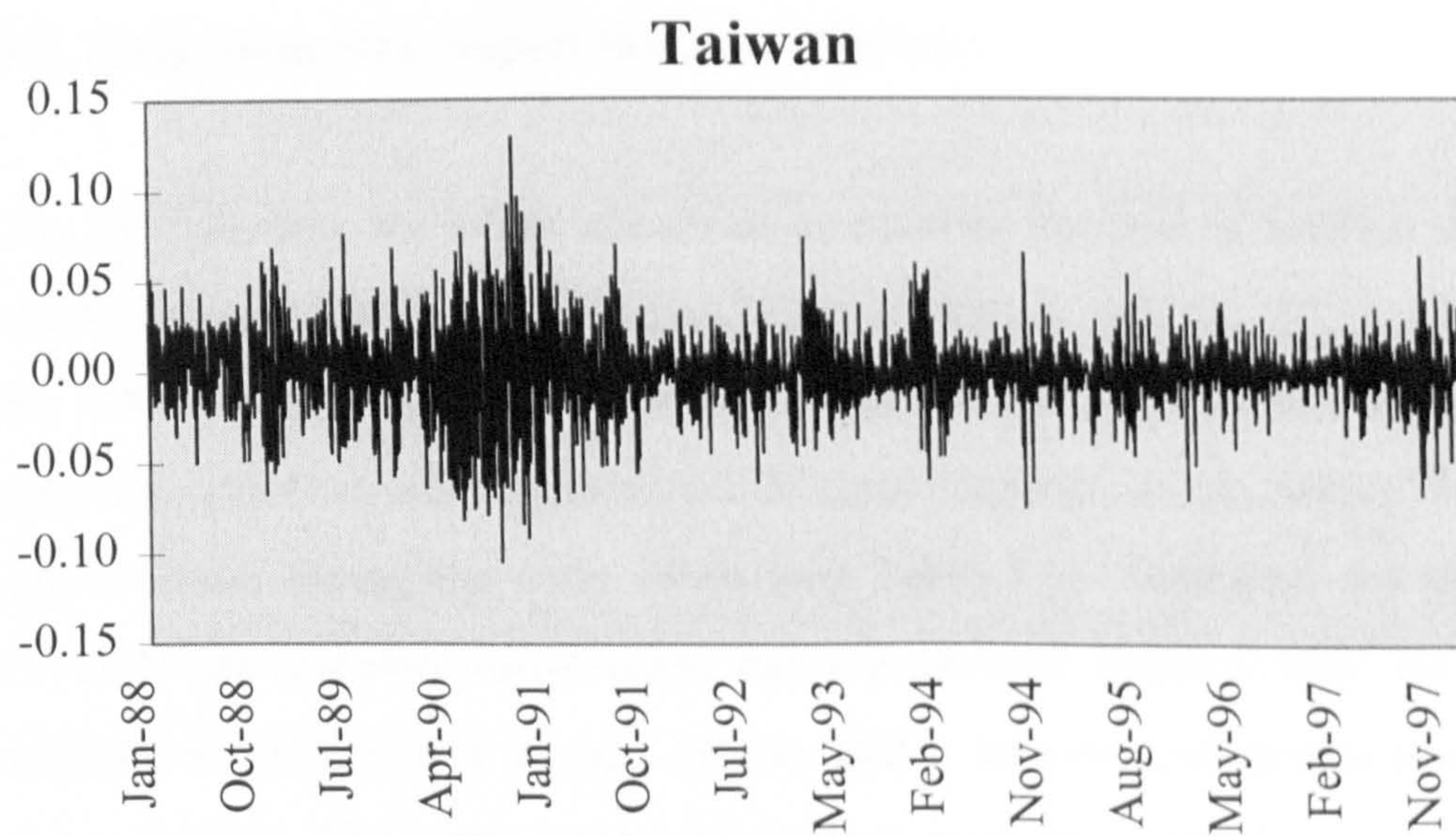


Figure 7.14. Adjusted daily returns of the Taiwan stock market index.



## **CHAPTER 8: REGIONAL AND GLOBAL STOCK MARKET**

### **INTEGRATION**

#### **8.1. Introduction**

In this chapter we examine if emerging stock markets became integrated following liberalisation. Integration is examined at the regional level as well as with the Standard and Poor's 500 index. The S&P500 is used as a proxy for a developed market. Stock market integration should be a consequence of the liberalisation of foreign investment in these markets. As it was discussed in chapter 3, liberalisation should bring these markets more in line with each other and with developed stock markets. Stock markets have two characteristics: returns and risk. If liberalisation had a positive effect on these markets we should be able to find integration with respect to both return and risk. We employ two methodologies to examine this issue. The first is to test for cointegration among the national stock indices and the second is a novel approach used in the country risk literature.

#### **8.2. Integration with respect to the stock prices**

The methodology we follow allows us to examine regional integration of the emerging stock markets, as well as integration of these markets with the US market as proxied by the S&P 500 index. We also test for changes in the cointegration relationship (if any) after liberalisation was implemented. In most countries, stock market liberalisation was implemented during the early 1990s [see Table 5.1]. Therefore, we test for common trends before and after liberalisation was implemented. Unfortunately, for the Asian stock markets we do not have enough data to split it into two subperiods (the sample period starts at 1985). Therefore, for the Asian stock markets we test for common trends for the whole period and then for the period January 1990 to November 1997. If indeed the markets were segmented before liberalisation was implemented, we should find weaker evidence of a cointegrating relationship for the whole period. If the markets became integrated after liberalisation we should find at least one cointegrating relationship with



all the variables significant in the cointegrating vector, during that period. For the Latin American countries we have enough observations to test for common trends before and after liberalisation. The first period is January 1976 to December 1989, and the second period is January 1990 to November 1997. We should expect to find no cointegrating relationships for the first period and at least one for the second period.

### **8.2.1. Other implications of stock market integration**

Integration among national stock markets has serious implications for the efficiency of these markets and the diversification potential offered by these markets. These issues were discussed in the literature review and although it is not our purpose to examine them extensively here, we feel we should explain what our results would imply with respect to these issues.

One of the reasons foreign investors enter emerging stock markets is the diversification potential offered by these markets [e.g. Divecha et. al. (1992), Speidell and Sappenfield (1992)]. By investing in these markets, investors can achieve higher expected returns and lower risk because the returns in these markets are uncorrelated with returns in developed markets. If however, we find that these markets are cointegrated with the US market, then there is no diversification benefits in the long run. Cointegration implies co-movement, and diversification requires the opposite. However, Kasa (1992) demonstrates that diversification benefits do not necessarily disappear if two or more stock markets are cointegrated. The crucial factor in this case is the speed of adjustment (the  $\alpha$  matrix). If the elements in this matrix are large values, then the markets are moving towards a common trend fast and there is little scope for diversification. If the values in the matrix are small, investors with finite horizons should not be affected by any co-movement towards the common trend<sup>1</sup>.

The results of our tests also have implications for the efficiency of these markets. Efficiency implies that the movement of the prices in a stock market cannot be predicted (i.e. it is random) [Fama (1965)]. Therefore, if two markets are collectively efficient in

---

<sup>1</sup> For this reason, several researchers focus only in the short term when they examine the potential for diversification [e.g. Levy and Sarnat (1970) and Solnik (1974)].

the long run, their indexes cannot cointegrate. In this case there is a potential for arbitrage [e.g. Arshanapalli and Doukas (1993)]. This is because cointegration implies that these markets move towards a common trend, so predictability cannot be ruled out. The Johansen methodology has been used by some researchers to examine long run collective efficiency among stock markets, mainly developed ones [e.g. Chan et. al. (1997)].

### 8.2.2. Empirical results

The first step in the analysis is to test for unit roots. The results from the Augmented Dickey-Fuller tests for the stock market indices are presented in Table 8.1. All variables have a unit root except the S&P 500 index. This however, is highly unlikely since rejection of a unit root would imply that the market is inefficient in the weak-form. Since this is improbable, we investigate it further. The graph of the S&P 500 index and its first difference is presented in Appendix 6. The graph indicates that the index itself is not stationary while its first difference does not appear to have a unit root<sup>2</sup>. Furthermore, the null hypothesis of a unit root is not strongly rejected (the statistic is only a little higher than the critical value). We can therefore conclude that the variable is I(1) and can be included in the estimation.

<b>Table 8.1. Augmented Dickey Fuller tests for unit roots in stock market indices and their first differences</b>		
	Index	First Difference
Argentina	-0.797 (3)	-8.542 (2)
Chile	-0.328 (0)	-4.592 (7)
India	-2.146 (0)	-13.063 (0)
Mexico	-1.153 (8)	-5.063 (7)
Pakistan	-1.471 (0)	-12.348 (0)
Philippines	-1.711 (0)	-7.384 (1)
South Korea	-1.783 (1)	-9.075 (0)
Taiwan	-2.621 (3)	-5.812 (3)
US	3.132 (10)	-5.443 (4)

*Notes to Table 8.1.*

- Figures in parentheses are the lag orders chosen by the AIC and the SBC.
- The critical value for both columns is : -2.8732

---

<sup>2</sup> The rejection of a unit root in the levels when it is clear that there is one, can be the result of a break in the series.

Table 8.2 Cointegration results for the Latin American and US markets January 1976 - December 1989						
$H_0: \text{rank}=p$	Trace	Cr Val (95%)	Cr Val (95%)	Max-eigen	Cr Val (95%)	Cr Val (95%)
$p = 0$	70.37**	53.48	49.95	32.91**	28.27	25.80
$p \leq 1$	37.45**	34.87	31.93	30.23**	22.04	19.86
$p \leq 2$	7.23	20.18	17.88	5.55	15.87	13.81
$p \leq 3$	1.67	9.16	7.53	1.67	9.16	7.53
Vector autocorrelation test: $F(32, 521) = 0.84 [0.7152]$						
Cointegrating Vectors (Normalised on Argentina and Chile):						
Argentina	Chile	Mexico	US			
1	-2.31	2.16	0.94			
-12.13	1	10.55	-13.23			

Notes to Table 8.2.

- \*\* and \* indicate significance at the 5% and 10% level respectively

Table 8.2. presents the cointegration results for the Latin American and the US markets for the first period (Jan. 1976 - Dec 1989). There are two cointegration vectors, signifying that the markets were integrated even before they were completely liberalised<sup>3</sup>. However, cointegration alone does not mean that all four markets have a common trend during that period. Table 8.3. presents the tests of significance for the coefficients in the cointegrating vectors, as well as tests of significance for the speed of adjustment coefficients. Since we have two cointegrating vectors, we have to test which variable is endogenous in which vector, and then present the restricted equations. The methodology followed is the same as in chapter 5, where the restrictions on the  $\alpha$  and  $\beta$  matrices are estimated jointly.

<sup>3</sup> The order of the VAR for all tests for cointegration is determined by the AIC and SBC reported by Microfit4.0 when we run the VAR. In several cases, for the chosen VAR length we still have serial correlation, so we add more lags until it disappears.



Table 8.3. Testing restrictions on the $\alpha$ and $\beta$ matrices from Table 8.2			
Weak exogeneity tests to the system		Weak exogeneity tests for each vector	
$\alpha_{\text{Argentina}} = 0$	$\chi^2(2) = 14.998^{**}$	$\alpha_{\text{Argentina}} = 0$	$\alpha_{\text{Argentina}} \neq 0$
$\alpha_{\text{Chile}} = 0$	$\chi^2(2) = 28.475^{**}$	$\alpha_{\text{Chile}} \neq 0$	$\alpha_{\text{Chile}} = 0$
$\alpha_{\text{Mexico}} = 0$	$\chi^2(2) = 1.041$	$\alpha_{\text{Mexico}} = 0$	$\alpha_{\text{Mexico}} = 0$
$\alpha_{\text{US}} = 0$	$\chi^2(2) = 9.769^{**}$	$\alpha_{\text{US}} = 0$	$\alpha_{\text{US}} \neq 0$
		$\chi^2(3) = 1.288$	
Test on restrictions on $\beta$ matrix			
Vector 1		Vector 2	
$\beta_{\text{Argentina}} = 0$	$\chi^2(1) = 14.84^{**}$	$\beta_{\text{Argentina}} = 0$	$\chi^2(1) = 12.16^{**}$
$\beta_{\text{Chile}} = 0$	$\chi^2(1) = 24.38^{**}$	$\beta_{\text{Chile}} = 0$	$\chi^2(1) = 4.664^{**}$
$\beta_{\text{Mexico}} = 0$	$\chi^2(1) = 1.999$	$\beta_{\text{Mexico}} = 0$	$\chi^2(1) = 24.13^*$
$\beta_{\text{US}} = 0$	$\chi^2(1) = 5.79^{**}$	$\beta_{\text{US}} = 0$	$\chi^2(1) = 5.48^{**}$

Notes to Table 8.3.

- \*\* and \* indicate significance at the 5% level and 10% level respectively.

The restrictions reveal that in the first vector only Mexico is insignificant and in the second vector all indices are significant. The endogeneity tests suggest that only Mexico is exogenous to the whole system. This means that changes in the Mexican stock market prices can explain changes in the other markets but the opposite is not true. Both the Argentinean and the US markets are exogenous and significant in the first vector. Chile is significant and endogenous in the first vector. This implies that although the three markets cointegrate, only the Chilean stock market responds to changes in the other two markets. The second vector suggests endogeneity for the Argentinean and the US stock market. Also all four markets are significant, which suggests that the Chilean and the Mexican stock market have some explanatory power for the Argentinean and the US stock markets. Taken jointly, the two vectors suggest integration among all four stock

markets. They also suggest that every market can explain part of the variation of every other market, except Mexico.

Since the four markets were integrated prior to liberalisation, we could argue that there would be limited scope for diversification for the international investor. As discussed earlier, an analysis of the diversification benefits is beyond the scope of this thesis. Such an analysis would require the examination of the elements of the  $\alpha$  matrix and their size. Additionally, we should examine the behaviour of short term movements in these markets. Using the present results, we can only infer that the potential for diversification is more limited than it would be if the markets were not integrated, at least for the long term investor.

With respect to efficiency, the results suggest that only Mexico is efficient relative to the other three markets. Argentina, Chile and the US stock market, can each be modelled as a function of the other two markets and their lagged price movements. Although this result is not unexpected for the Argentinean and the Chilean stock markets, it is surprising that the US stock market is also endogenous in the model. It is unlikely that the S&P500 index can be affected by either the Argentinean or the Chilean stock market, so the results should be treated with caution.

Table 8.4 Cointegration results for the Latin American and US markets						
January 1990 - November 1997						
$H_0$ : rank=p	Trace	Cr Val (95%)	Cr Val (95%)	Max-eigen	Cr Val (95%)	Cr Val (95%)
p = 0	45.64	53.48	49.95	24.18	28.27	25.80
p ≤ 1	21.46	34.87	31.93	11.59	22.04	19.86
p ≤ 2	9.87	20.18	17.88	5.70	15.87	13.81
p ≤ 3	4.17	9.16	7.53	4.17	9.16	7.53

Notes to Table 8.4.

- \*\* and \* indicate significance at the 5% and 10% level respectively

Table 8.4. presents the cointegration results for the period Jan 1990 to Nov 1997 for the Latin American and the US stock markets. The results suggest that there are no cointegrating relationships among the four variables. In other words, during this period the four stock markets were moving in separate directions without following a common trend. There are several explanations for this. One could be that our sample period is too short. This period includes the 1994 Mexican crisis. The crisis hit other Latin American stock markets too, but the effect of the crisis varied from country to country. Since we do not have a longer period it is possible that the crisis could dominate our estimates and show that the markets move in separate directions. Another possible explanation could be that the markets were indeed used for speculation purposes by foreign and domestic investors, in which case, there is no reason why they should follow some common trend.

Table 8.5 Cointegration results for the Asian and US markets						
January 1985 - November 1997						
$H_0$ : rank=p	Trace	Cr Val (95%)	Cr Val (95%)	Max-eigen	Cr Val (95%)	Cr Val (95%)
p = 0	99.27**	95.87	91.40	37.56*	39.83	36.84
p ≤ 1	61.72	70.49	66.23	28.89	33.64	31.02
p ≤ 2	32.83	48.88	45.70	18.85	27.42	24.99
p ≤ 3	13.99	31.54	28.78	11.11	21.12	19.02
p ≤ 4	2.87	17.86	15.75	2.86	14.88	12.98
p ≤ 5	0.017	8.07	6.50	0.017	8.07	6.50
Vector autocorrelation test: F(72, 713) = 1.13 [0.2315]						
Cointegration Vector (Normalised on India):						
India	Pakistan	Philippines	South Korea	Taiwan	US	
1	-1.36	0.016	-0.658	0.352	0.508	

Notes to Table 8.5.

- \*\* and \* indicate significance at the 5% and 10% level respectively

Table 8.5 presents the results for the Asian stock markets. The sample period covers 13 years from 1985 to 1997. If the markets became more integrated after liberalisation we should expect to find no cointegrating relationship for this sample period because it



includes a few years when the Asian stock markets were not liberalised. The results indicate the existence of one cointegration vector, meaning that the markets were integrated even before liberalisation. However, we should be cautious in explaining these results because we do not have a long sample period. We know that the stock markets in Asian countries introduced most of the biggest liberalisation reforms during the late 1980s and early 1990s. Therefore, the sample we have does not go back long enough to allow us to argue that there is indeed a large pre-liberalisation period in our sample. Additionally, most Asian stock markets were open to foreign investors up to a limited point even before the 1990s. Therefore, some degree of integration could exist before the 1990s.

Table 8.6 Testing restrictions on the $\alpha$ and $\beta$ matrices from Table 8.5.			
Weak exogeneity tests to the system		Tests on restrictions in the vector	
$\alpha_{\text{India}}$	$= 0 \quad \chi^2(1) = 0.566$	$\beta_{\text{India}}$	$= 0 \quad \chi^2(1) = 0.148$
$\alpha_{\text{Pakistan}}$	$= 0 \quad \chi^2(1) = 0.034$	$\beta_{\text{Pakistan}}$	$= 0 \quad \chi^2(1) = 0.797$
$\alpha_{\text{Philippines}}$	$= 0 \quad \chi^2(1) = 8.063^{**}$	$\beta_{\text{Philippines}}$	$= 0 \quad \chi^2(1) = 0.476$
$\alpha_{\text{S.Korea}}$	$= 0 \quad \chi^2(1) = 5.641^{**}$	$\beta_{\text{S.Korea}}$	$= 0 \quad \chi^2(1) = 10.45^{**}$
$\alpha_{\text{Taiwan}}$	$= 0 \quad \chi^2(1) = 4.001^{**}$	$\beta_{\text{Taiwan}}$	$= 0 \quad \chi^2(1) = 10.89^{**}$
$\alpha_{\text{US}}$	$= 0 \quad \chi^2(1) = 5.578^{**}$	$\beta_{\text{US}}$	$= 0 \quad \chi^2(1) = 2.388$

Notes to Table 8.6.

- \*\* and \* indicate significance at the 5% level and 10% level respectively.

The restrictions on the  $\alpha$  and  $\beta$  matrices are presented in Table 8.6. The exogeneity tests reveal that there is regional cointegration among the South East Asian markets of our sample. The only exogenous stock markets in the model are India and Pakistan. Also, the US stock market is endogenous. The restrictions on the coefficients in the vector, suggest that only the South Korean and the Taiwanese markets are significant. The Filipino and the American markets are not significant (although they are endogenous). The results suggest that during the whole sample period there is some degree of regional integration, with two South East Asian markets integrated and endogenous in the system. There is no global integration since the US market is statistically insignificant in the vector.

Table 8.7 Cointegration results for the Asian and US markets						
January 1990 - November 1997						
H <sub>0</sub> : rank=p	Trace	Cr Val (95%)	Cr Val (95%)	Max- eigenvalue	Cr Val (95%)	Cr Val (95%)
p = 0	124.9**	95.87	91.40	45.12**	39.83	36.84
p ≤ 1	79.76**	70.49	66.23	41.18**	33.64	31.02
p ≤ 2	38.58	48.88	45.70	17.02	27.42	24.99
p ≤ 3	21.56	31.54	28.78	11.48	21.12	19.02
p ≤ 4	10.09	17.86	15.75	9.96	14.88	12.98
p ≤ 5	0.129	8.07	6.50	0.129	8.07	6.50
Vector autocorrelation test: F(72, 228) = 1.015 [0.4551]						
Cointegration Vectors (Normalised on India and Pakistan)						
India	Pakistan	Philippines	South Korea	Taiwan	US	
1	-0.934	0.059	-0.064	-0.149	-0.139	
-0.461	1	-0.044	0.656	-0.333	-0.209	

Notes to Table 8.7.

- \*\* and \* indicate significance at the 5% and 10% level respectively

The picture after liberalisation changes dramatically, as it is shown from the results in Table 8.7. Both the trace and the maximum eigenvalue statistics increase by a third and there is strong evidence of two cointegration vectors, instead of one. The results signal that the markets became more integrated during the 1990s. Again, these results should be viewed with caution because the sample period is rather small. However, comparing the results from the whole period and the second period, it is obvious that the relationships between these markets changed dramatically.

Table 8.8 Testing restrictions on the $\alpha$ and $\beta$ matrices from Table 8.7			
Weak exogeneity tests to the system		Weak exogeneity tests for each vector	
$\alpha_{\text{India}} = 0$	$\chi^2(2) = 11.77^{**}$	$\alpha_{\text{India}} \neq 0$	$\alpha_{\text{India}} = 0$
$\alpha_{\text{Pakistan}} = 0$	$\chi^2(2) = 2.53$	$\alpha_{\text{Pakistan}} = 0$	$\alpha_{\text{Pakistan}} = 0$
$\alpha_{\text{Philippines}} = 0$	$\chi^2(2) = 12.17^{**}$	$\alpha_{\text{Philippines}} = 0$	$\alpha_{\text{Philippines}} \neq 0$
$\alpha_{\text{S.Korea}} = 0$	$\chi^2(2) = 7.56^{**}$	$\alpha_{\text{S.Korea}} = 0$	$\alpha_{\text{S.Korea}} \neq 0$
$\alpha_{\text{Taiwan}} = 0$	$\chi^2(2) = 3.61$	$\alpha_{\text{Taiwan}} = 0$	$\alpha_{\text{Taiwan}} = 0$
$\alpha_{\text{US}} = 0$	$\chi^2(2) = 4.73^*$	$\alpha_{\text{US}} \neq 0$	$\alpha_{\text{US}} = 0$
$\chi^2() =$			
Test on restrictions on $\beta$ matrix			
Vector 1		Vector 2	
$\beta_{\text{India}} = 0$	$\chi^2(1) = 14.3^{**}$	$\beta_{\text{India}} = 0$	$\chi^2(1) = 1.9$
$\beta_{\text{Pakistan}} = 0$	$\chi^2(1) = 16.1^{**}$	$\beta_{\text{Pakistan}} = 0$	$\chi^2(1) = 0.007$
$\beta_{\text{Philippines}} = 0$	$\chi^2(1) = 0.86$	$\beta_{\text{Philippines}} = 0$	$\chi^2(1) = 8.84^{**}$
$\beta_{\text{S.Korea}} = 0$	$\chi^2(1) = 1.396$	$\beta_{\text{S.Korea}} = 0$	$\chi^2(1) = 0.22$
$\beta_{\text{Taiwan}} = 0$	$\chi^2(1) = 0.237$	$\beta_{\text{Taiwan}} = 0$	$\chi^2(1) = 31.03^{**}$
$\beta_{\text{US}} = 0$	$\chi^2(1) = 9.64^{**}$	$\beta_{\text{US}} = 0$	$\chi^2(1) = 15.2^{**}$

Notes to Table 8.8.

- \*\* and \* indicate significance at the 5% level and 10% level respectively.

These changes become apparent in Table 8.8. The results suggest that there are two regions and both are integrated with the US market. The first vector indicates cointegration among India, Pakistan and the US. The results for the whole period suggest that India and Pakistan did not enter the cointegrating relationship. The above table suggests that after liberalisation, integration between the two markets increased. Also, the US market is significant in the first vector, suggesting that the two Asian markets have a common trend with the US stock market. The exogeneity tests show India and the US markets to be endogenous in the first vector. While India could be endogenous, it is rather unlikely that the US stock market reacts to changes in the Indian and the Pakistani stock markets.



The results for the second vector show integration within another regional block: the South East Asian stock markets. There are a few differences with respect to the whole period. The South Korean stock market is not significant in the vector anymore, which is another reason why we should be cautious with the results. Since the South Korean and the Taiwanese stock market followed a common trend for the whole sample period, this common trend should appear in any estimation using sub-periods. However, this is not the case. Again, one reason why this could happen is because of the small sample period. The results for the 1990s suggest that the Filipino, the Taiwanese and the US stock markets follow a common trend. From the three markets, only the Filipino market is endogenous in the system, which is a plausible result. Both the Taiwanese and the US economies are bigger than the Filipino economy, so it is not surprising to find that the latter may react to changes in the two former markets. Apart from the endogeneity of the US in the first vector, the results for the 1990s are not implausible, and suggest the existence of two regions in Asia.

With respect to diversification, the results provide some limited evidence. The Asian stock markets seem to be more integrated after liberalisation, so the scope for international diversification using these markets may be diminished. The Latin American markets present the opposite picture: some integration before liberalisation which disappears afterwards. Therefore, international investors could achieve higher returns with lower risk by including these markets in their portfolios. However, for reasons discussed before, one should be cautious when drawing conclusion from cointegration analysis for international diversification potential. At best, the results apply only to investors with long term horizons and more tests are needed to show by how much the diversification potential is affected by the common trend.

With respect to efficiency, cointegration implies that there is long term predictability among the markets, so they are not collectively efficient in the long run. It should be noted that we do not reject efficiency based on our results. The evidence we have with respect to the long run efficiency of these markets is extremely limited and more tests are needed if we are to draw any conclusions on this matter.

### **8.3. Empirical analysis of convergence between emerging and developed countries' risk premium**

#### **8.3.1. Introduction**

In this section we examine if the risk premium of the developing countries in our sample converged to that of the US. Actually, because the US is assumed to be the safest borrower (in dollars), its risk premium is assumed to be zero. The methodology we apply here is used to examine country risk and not stock market risk, therefore we should justify why we use it.

The methodology utilises the option pricing formula. We feel that this is appropriate because we want to examine risk and the options pricing formula is one of the most advanced tools in the analysis of risk. However, the variables we must use to apply the formula are not stock market data, but national data. This is because we have to measure riskiness using the debt level of every market and there are no available data on the debt level of the companies listed on the emerging stock markets of our sample. Debt data are available for national economies only, so we examine the riskiness of national economies instead of the riskiness of national stock markets. This is not a problem, if we assume that the stock market of an economy is a good proxy of the economy itself<sup>4</sup>. Indeed, in more developed markets, the stock market is one of the main indicators of economic performance. Therefore, we feel that we can use the economy and the stock market interchangeably. Lower economic risk would imply lower stock market risk.

Convergence in the level of risk after liberalisation should come because the emerging markets should attract funds from abroad, which means increased investment and increased revenue. In other words, the value of the economy will increase. Another effect of liberalisation should be the reduction of debt or the rescheduling of debt. If the emerging economies benefit from liberalisation, then part of the gap between savings and

---

<sup>4</sup> We understand that this is a rather strong assumption. It is only valid if the stock market is a very good representative of the economy. If most of the firms comprising the market of a country are not listed on the stock market, then changes in the index will not necessarily reflect changes in the economic situation of the country examined.

investment should be filled by foreign capital instead of foreign debt (as was the case prior to liberalisation). The debt-equity ratio should decline making companies in these countries a safer bet. However, we recognise that debt could increase instead. Higher investment could increase the demand for capital goods which the emerging economies are unlikely to produce. In this case, foreign debt could increase to cover the demand for the imported capital goods. However, since the economy will be seen to becoming more productive, these loans from abroad can be obtained on better terms; i.e. lower rates and longer maturities. In this case, although debt will increase, the value of the economy will increase by more than the debt<sup>5</sup>.

Finally, the economy's growth should be relatively stable. Since the emerging economy offers higher returns, foreign investors should enter the country for the long term; i.e. until the country's profitability is equalised to that of the developed markets. In this case the economy's growth should be stable and higher than the developed economies'.

Our methodology is appropriate, because it responds to changes in the three variables of interest: market value, debt level and stability of returns. If liberalisation yields the desired effects, the options pricing formula should give a lower price year by year. If the effects are not the desired ones (e.g. growth which results in increased spending and foreign indebtedness like in Mexico in the late 1970s, or opportunistic foreign investment, entering a country for the short term resulting in unstable returns for the economy) then the options pricing formula will give a stable or increasing price for the country during our sample period.

Finally, the methodology is appropriate in examining convergence, because it allows us to compare an emerging country with a developed one. The developed country's growth is exogenous in the analysis; i.e. it is not affected by the emerging economy's growth. This is accounted for in the present analysis, because the financial risk premium is derived using the US government offered interest rate. By comparing this rate to the respective interest rate of the emerging economy year by year, we examine not only if the

---

<sup>5</sup> Since it will be used for productive purposes, the net present value of the debt and the investment carried out by this debt will be positive.



emerging economy is growing, but if it is growing faster than the developed economy, which in this analysis is the US.

The financial risk premium is calculated and plotted for every year of the sample period for every country. If it decreases year by year, we can conclude that the results favour the liberalisation thesis. If the financial risk premium does not decrease during the sample period, this would imply that the liberalisation process did not result in convergence of the risk level among developing and developed countries.

### **8.3.2. Calculation of the financial risk premium for the sample countries**

We begin the analysis by constructing the variables. The first variable is the market value. As was explained in Chapter 5, we have to estimate the market value of each economy for the year preceding the first year of our sample. To obtain these estimates we run regression (29) for each country in our sample for the 18-year period 1967-1984.

The results are presented in Table 8.9. The results seem reasonable, except for Mexico and Pakistan where the constant (which represents profits for 1966) is negative. Inspecting the diagnostic tests, we see that the regression for Mexico suffers from serial correlation and the DW statistic is very low (actually the DW statistic is low for all regressions, but above 1. Only for Mexico is the DW below 1). Since we cannot get a reasonable estimate for the value of the Mexican economy, we assume that it is equal to zero<sup>6</sup>. Also the constants for Pakistan and South Korea are strongly insignificant so, the market value of these countries in 1966 is also assumed to be zero. In Chile, the constant is significant only at the 11.4% significance level. Because the variables we use are macroeconomic estimates which are by their nature inaccurate, it is better to accept low levels of significance in these regressions. Therefore, we accept that the profits of the Chilean economy in 1966 were 10.1 billion escudos. All regressions have a high  $R^2$  which means that the regressions explain a large percentage of the variation in profits. To

---

<sup>6</sup> Assuming that the market value for 1966 is zero has very little effect on the estimates of expected rates of return and variance. Most of the countries in our sample experienced high rate of inflation so, the effect of the constant disappears anyway after a few years [see: Clark (1991) p. 80].

find the market value for these countries in 1966, we capitalise the profits for that year at the economy's estimated rate of return (the coefficient of the independent variable).

<p><b>Table 8.9</b></p> <p><b>Results for 1967 - 1984 for the regression</b></p> $X_t - M_t + (V_{t+1} - V_t) = c + r(V_t)$ <p>The constant (c) represents profits for 1966 and r represents the rate of return for the sample period.</p>					
	<b>c</b>	<b>r</b>	<b>DW</b>	<b>LM test for autocorrelation</b>	<b>R<sup>2</sup></b>
Chile	10.1 (1.67)	0.146 (9.055)	1.295	2.03	0.837
India	25.57 (6.47)	0.1 (27.55)	1.038	4.13	0.979
Mexico	-0.3054 (-3.01)	0.49 (21.78)	0.5	11.55	0.967
Pakistan	-1.77 (-1.02)	0.137 (13.38)	1.74	0.00	0.918
Philippines	3.76 (2.28)	0.126 (16.2)	1.67	0.07	0.943
South Korea	142.75 (0.51)	0.204 (26.97)	1.05	4.02	0.978

*Notes to Table 8.9*

The figures in parentheses are t-ratios.

The figures in brackets are probabilities.

All values are expressed in local currency.

The LM test for autocorrelation is distributed as  $\chi^2(1)$ .

The market value for 1966 is used as a starting point to construct the market value for the countries in our sample. The next step is to estimate the debt of the six countries for the sample period (see also appendix 4). The estimated markets values and total debts are plotted in Figures 8.1 - 8.6.



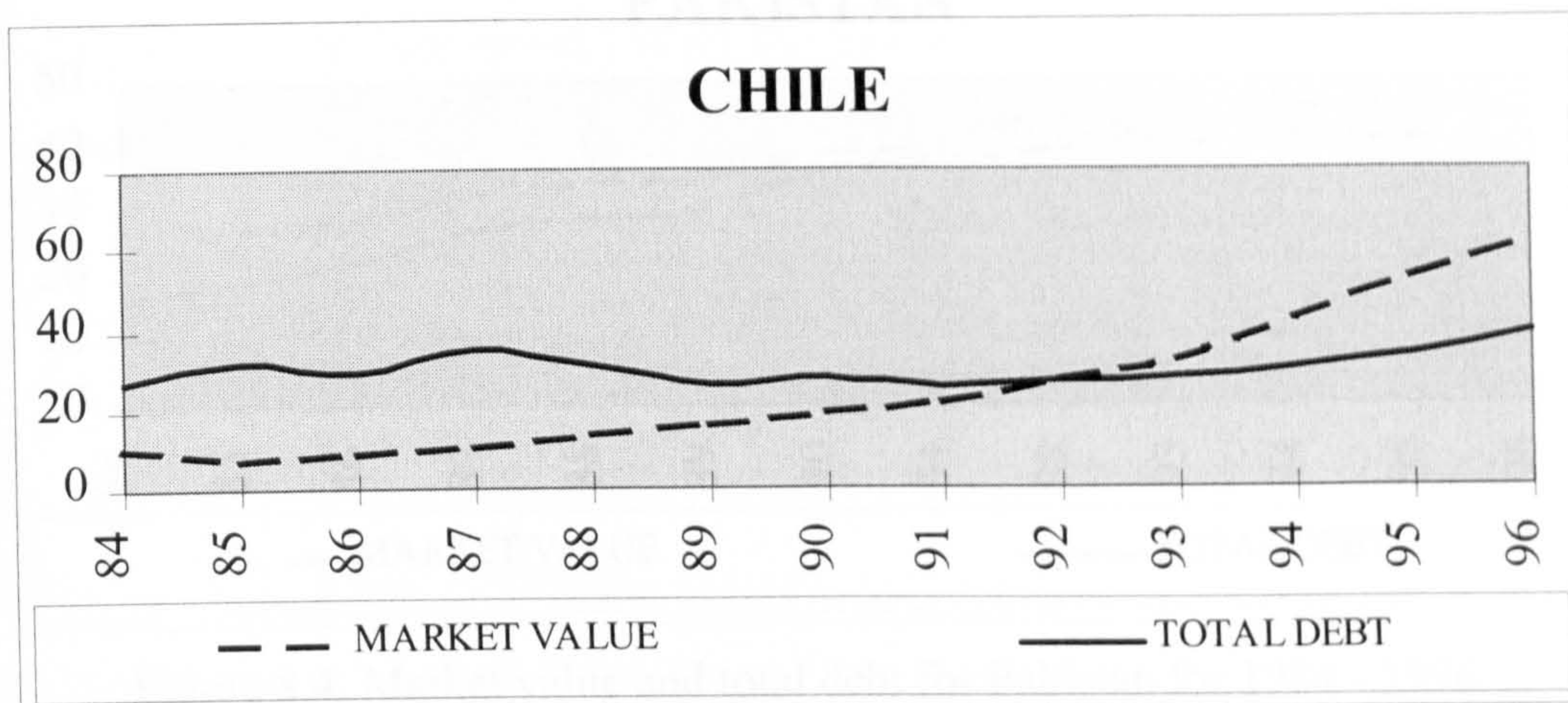


Figure 8.1. Market value and total debt for Chile for 1984 - 1996

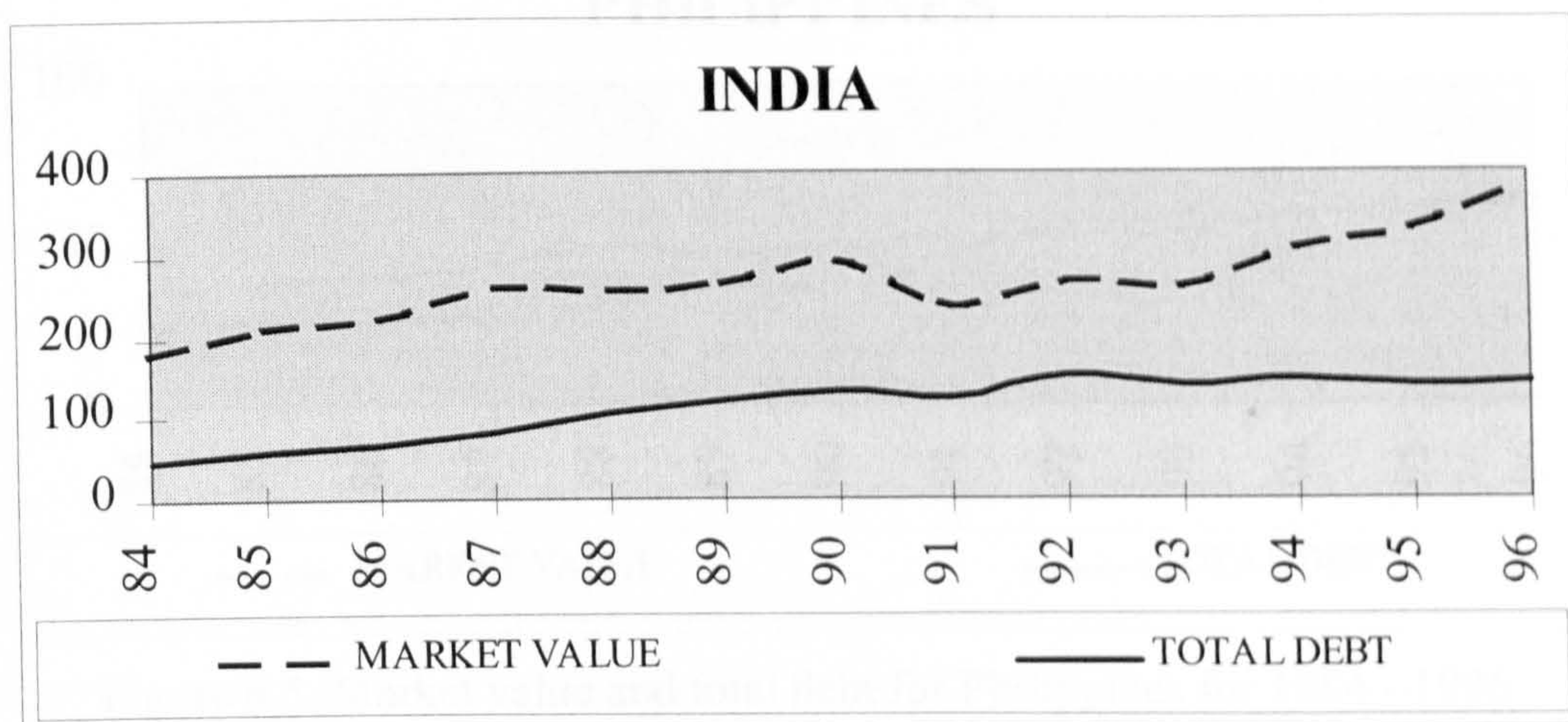


Figure 8.2. Market value and total debt for India for 1984 - 1996

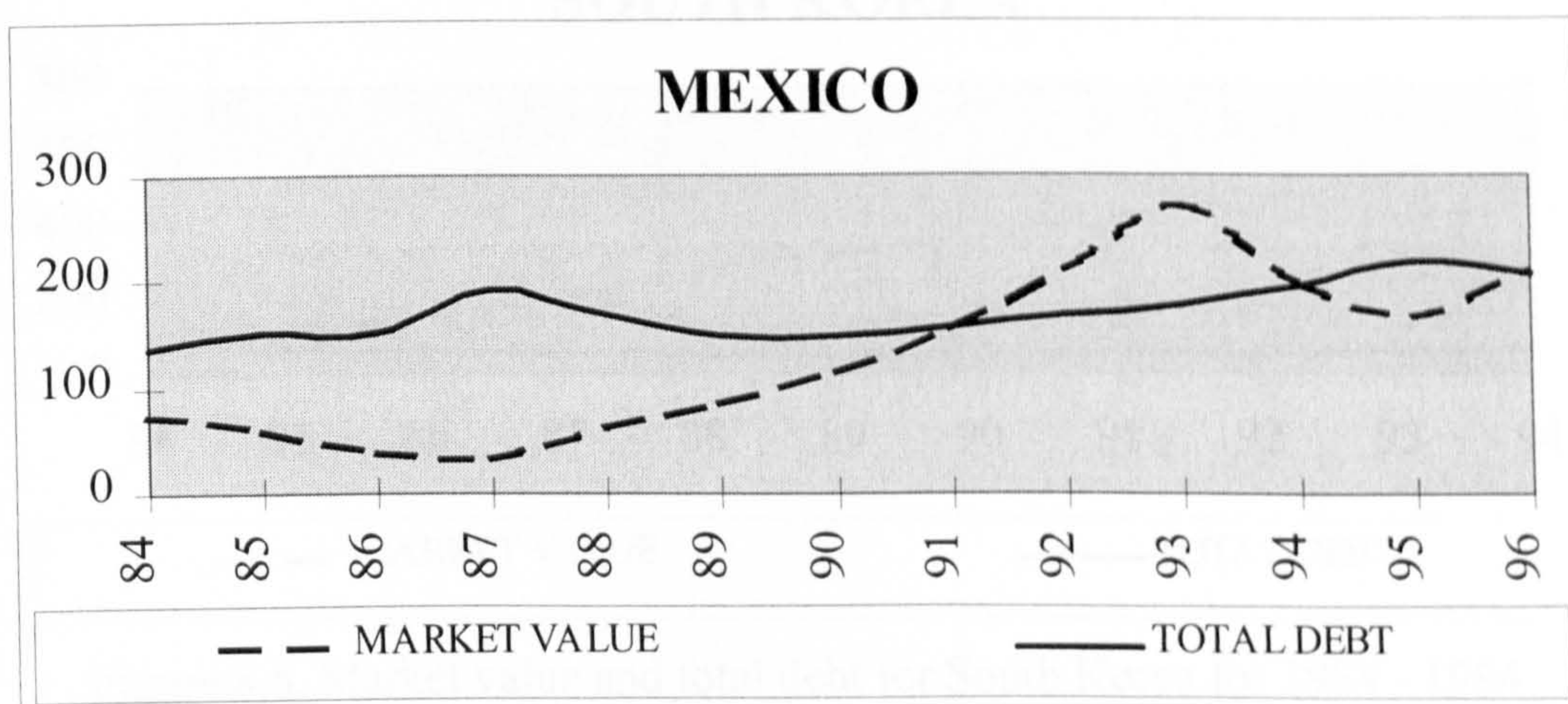


Figure 8.3. Market value and total debt for Mexico for 1984 - 1996



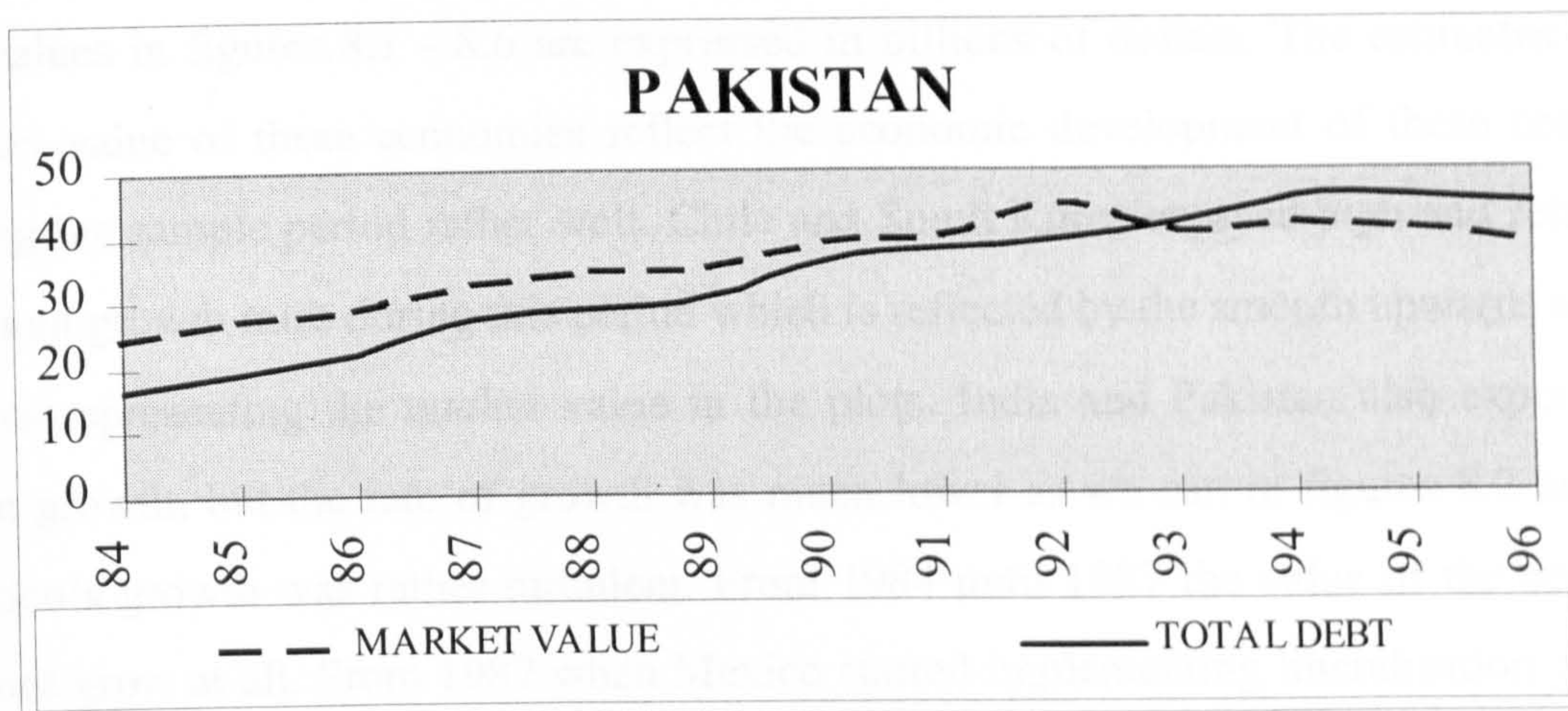


Figure 8.4. Market value and total debt for Pakistan for 1984 - 1996

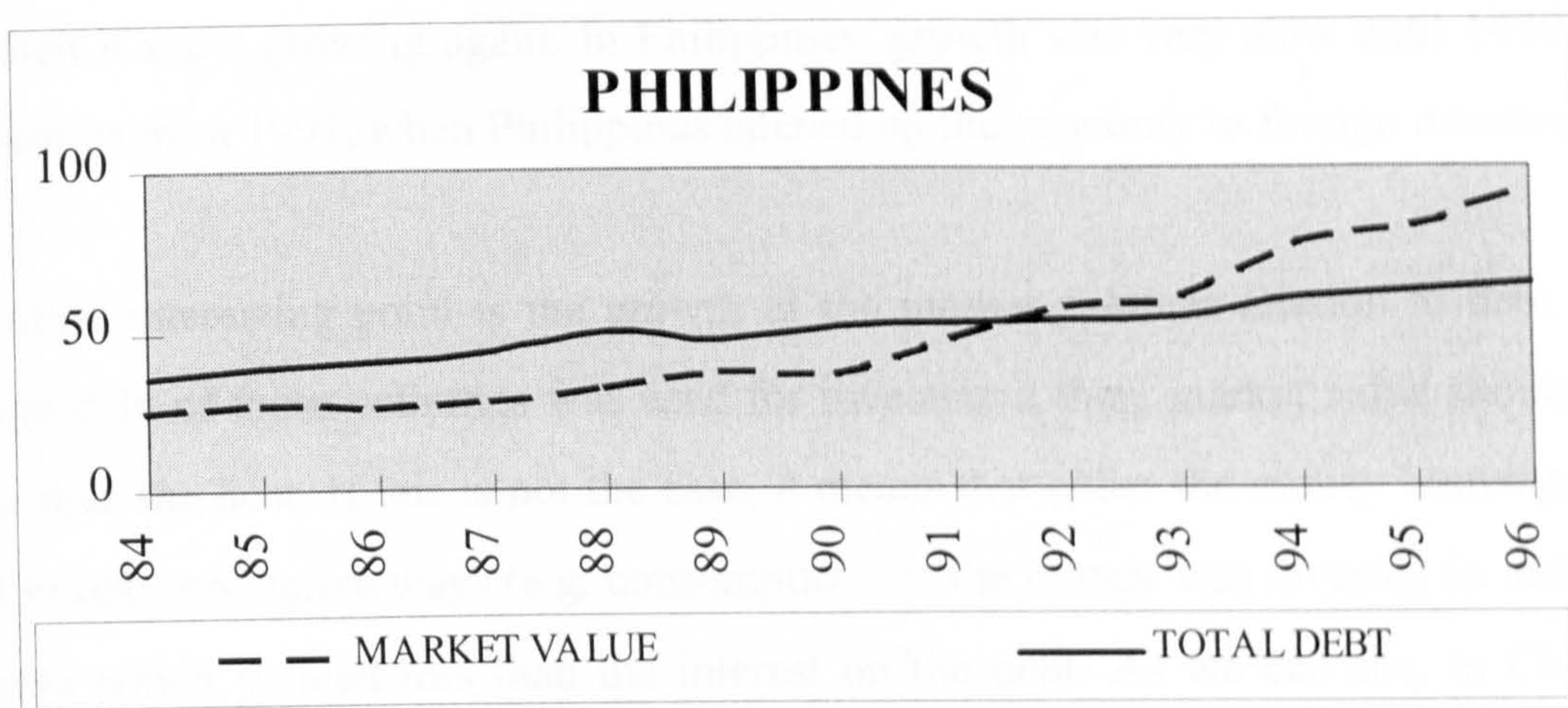


Figure 8.5. Market value and total debt for Philippines for 1984 - 1996

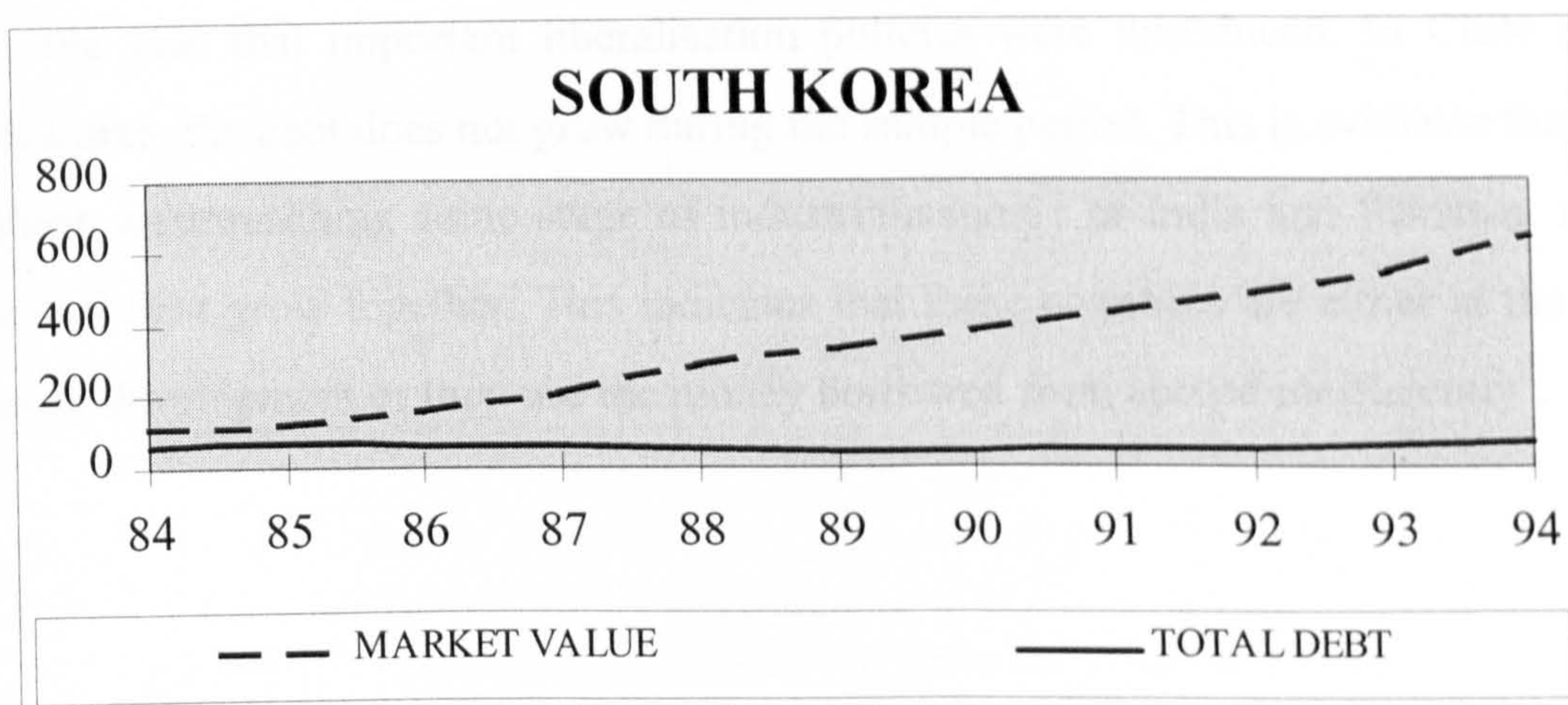


Figure 8.6. Market value and total debt for South Korea for 1984 - 1994



All values in figures 8.1 - 8.6 are expressed in billions of dollars. The estimates of the market value of these economies reflect the economic development of these countries during the sample period rather well. Chile and South Korea enjoyed high and relatively constant growth rates during this period which is reflected by the smooth upwards sloping curves representing the market value in the plots. India and Pakistan also experienced some growth, but the rate of growth was much lower as we can in figures 8.2 and 8.4. Mexico's growth was rather turbulent. From 1984 until 1987 the value of the economy did not grow at all. From 1987 when Mexico started implementing liberalisation policies growth accelerates at a much faster pace. This, however, stops in 1994 because of the peso crisis. The market value of the economy drops by about 30% from 1993 to 1995, and then it starts growing again. In Philippines, growth was very slow until 1990 but it accelerates from 1991, when Philippines opened up the economy to foreign investors.

The other interesting point is the growth of the market value in relation to debt. If the foreign debt of these countries was used for investment then, market value should grow faster than the debt. If this is not the case, it means that either the money borrowed were used in non-productive ways (e.g. consumption) or the money was invested in inefficient projects which yielded less than the interest on the debt. As we can see, in Chile and South Korea (and to a lesser extent in Philippines), the market value of these economies grew faster than their respective foreign debts. In Philippines, this trend appears after 1991, the year that important liberalisation policies were introduced. In Chile and in South Korea, the debt does not grow during the sample period. This is evidence that these countries were reaching some stage of industrialisation<sup>7</sup>. In India and Pakistan, market value and debt grow together. This indicates that these countries are either at the initial stages of development or they use the money borrowed from abroad inefficiently<sup>8</sup>.

---

<sup>7</sup> In other words, they are beyond the stage of development where they run increasing deficits in order in order to accumulate physical capital.

<sup>8</sup> It is more likely that both countries do not use their foreign debt efficiently. India has a long history of inefficient investment and welfare measures which damage more than they benefit the economy (see chapter 2). In the case of Pakistan, foreign debt has not contributed to economic growth [see: Chaudhary and Ali (1993)]



Once we constructed all the necessary variables, we can use them to find the value of each economy owned by the residents<sup>9</sup>. If we subtract this value from the total value of the economy, we get the market value of each country's debt. The results are plotted in figures 8.7 to 8.12. The value of the residents equity is calculated assuming that foreigners can appropriate 100% of the economy's value. In reality, in most countries, foreigners can legally acquire less than that. Therefore, in the estimation of the financial risk premium, we take into account the percentage of each economy which can legally be owned by foreigners.

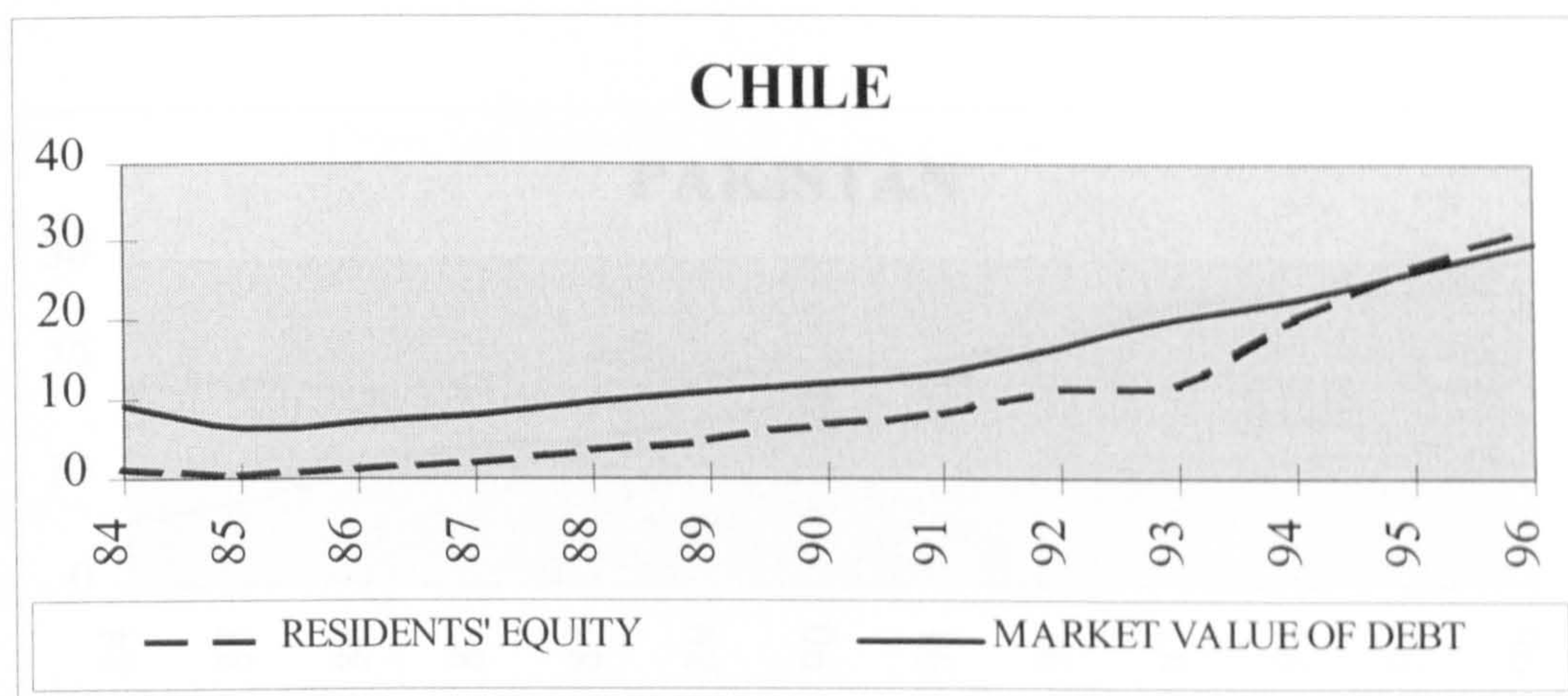


Figure 8.7. Value of residents equity and market value of debt in Chile.

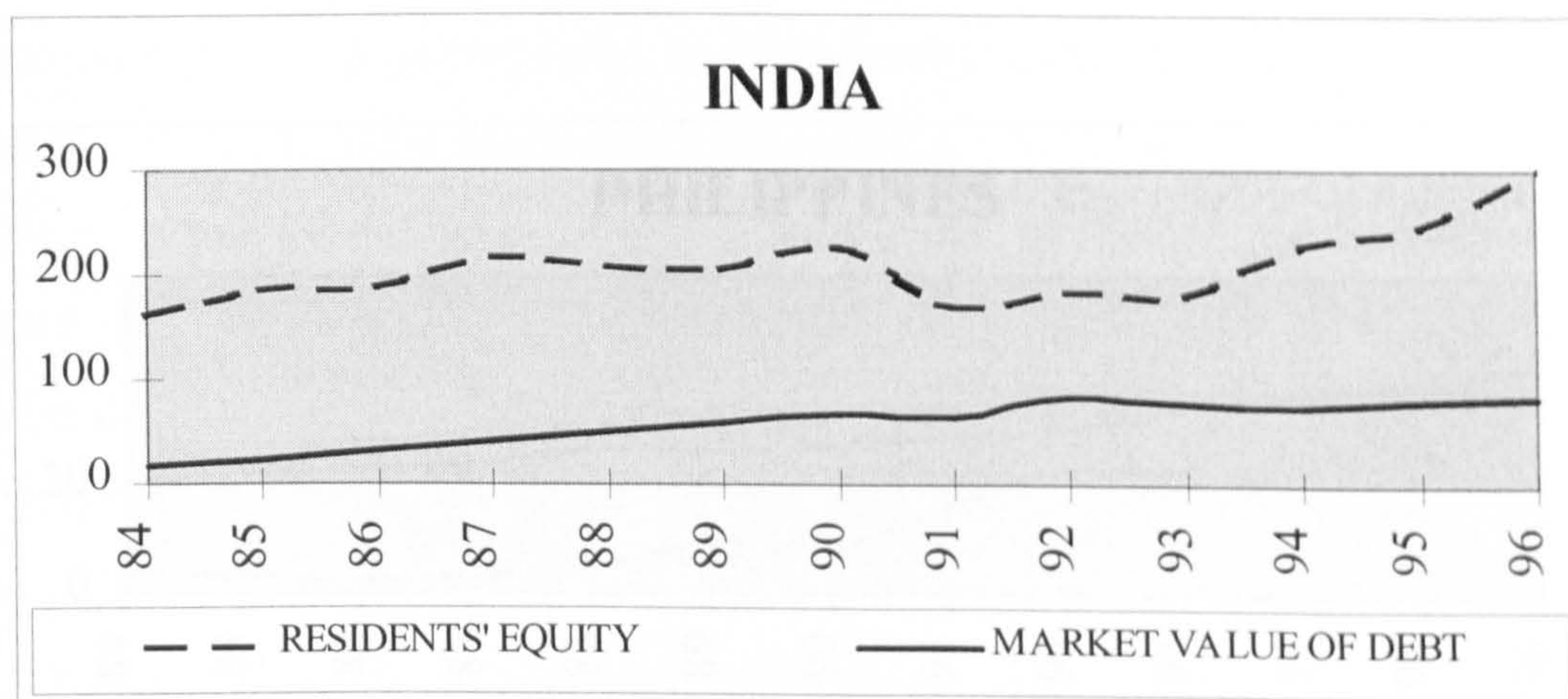


Figure 8.8. Value of residents equity and market value of debt in India.

<sup>9</sup> In the options pricing formula, this is the value of the call.



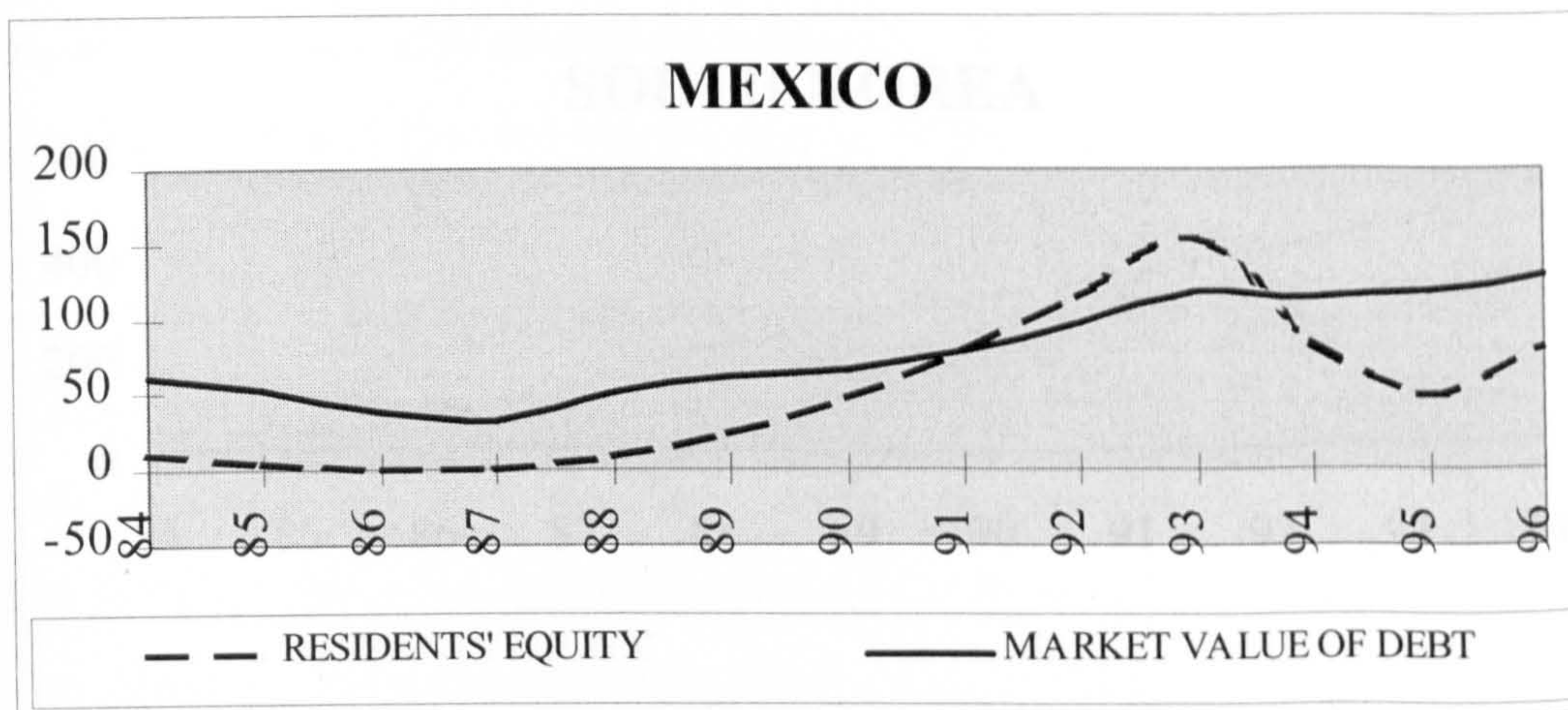


Figure 8.9. Value of residents equity and market value of debt in Mexico.

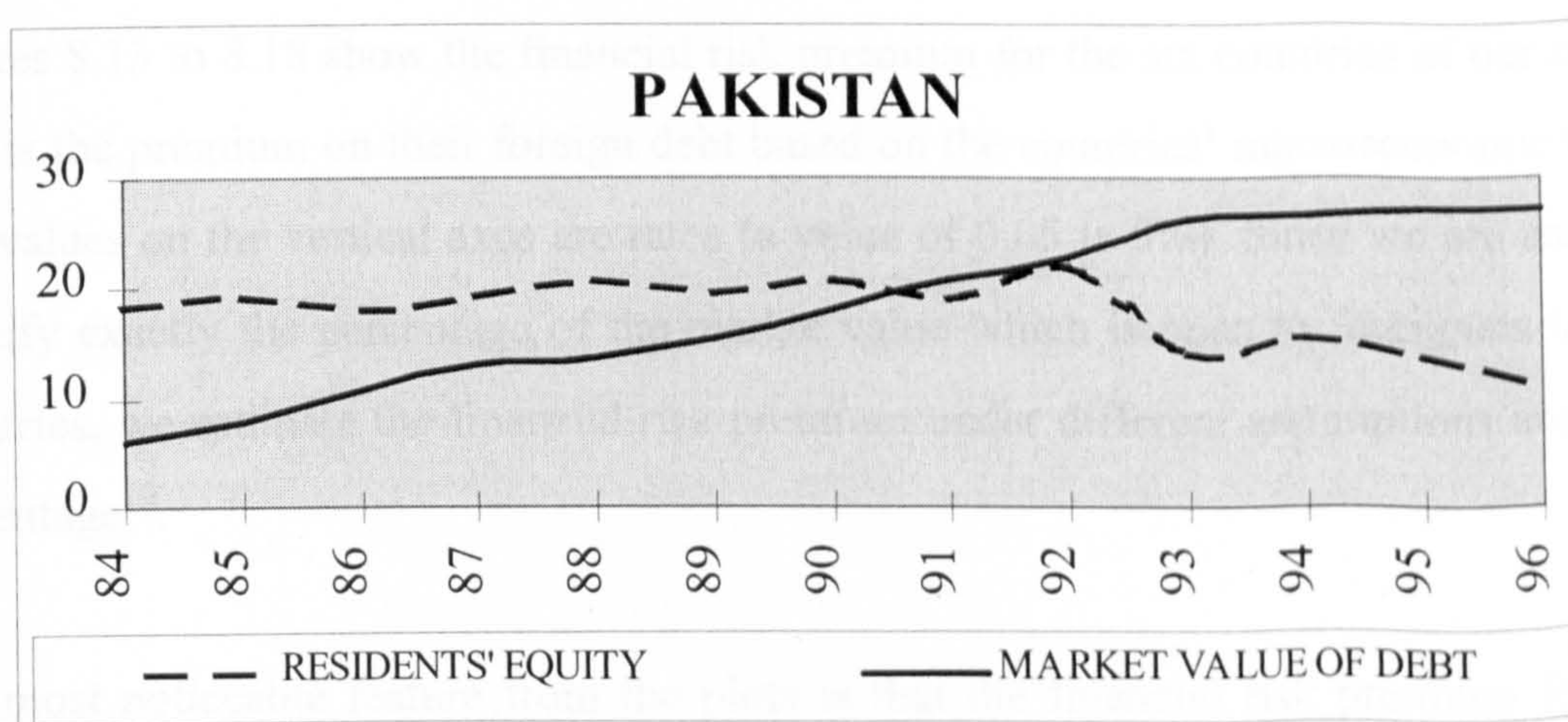


Figure 8.10. Value of residents equity and market value of debt in Pakistan.

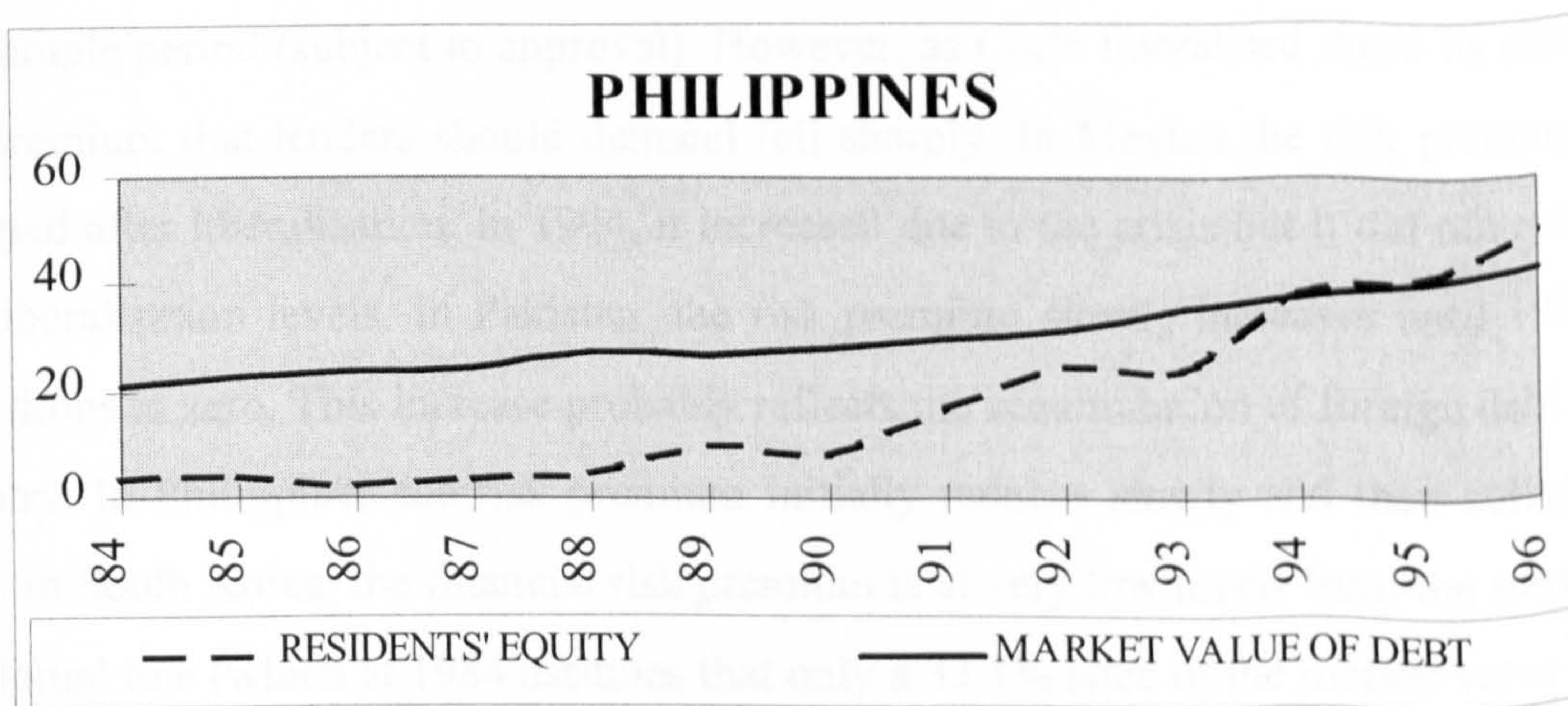


Figure 8.11. Value of residents equity and market value of debt in Philippines.



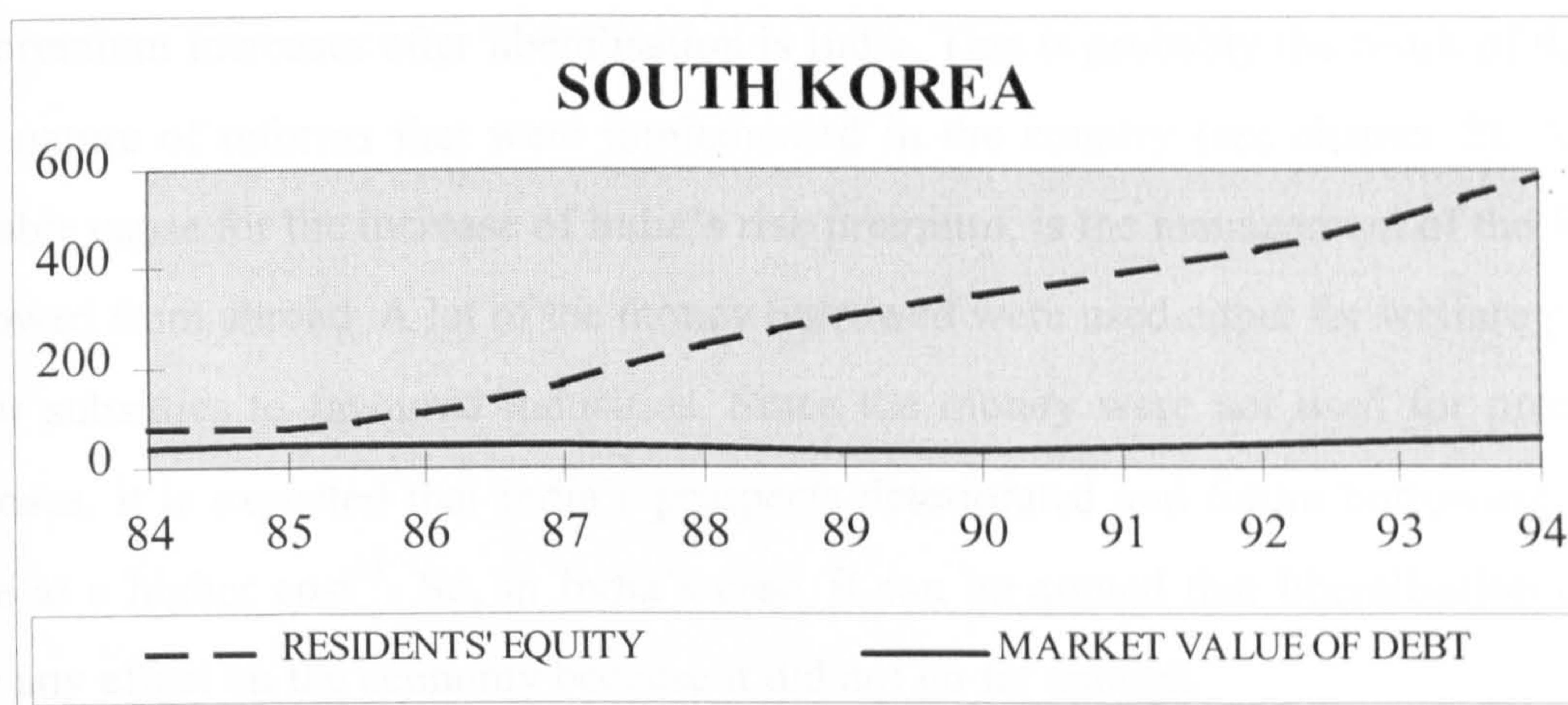


Figure 8.12. Value of residents equity and market value of debt in South Korea.

Figures 8.13 to 8.18 show the financial risk premium for the six countries of our sample. This is the premium on their foreign debt based on the countries' macroeconomic values. The values on the vertical axes are rates (a value of 0.05 is 5%). Since we are unable to identify exactly the percentage of the market value which is open to foreigners in these countries, we estimate the financial risk premium under different assumptions about this percentage<sup>10</sup>.

The most noticeable feature from the plots is that the financial risk premium for most countries falls dramatically after the liberalisation policies were implemented. This is the case in all countries except India. In Chile foreign ownership was always free during the sample period (subject to approval). However, as Chile liberalised more its economy, the premium that lenders should demand fell sharply. In Mexico the risk premium also dropped after liberalisation. In 1994, it increased due to the crisis but it did not reach the pre-liberalisation levels. In Pakistan, the risk premium slowly increases until 1991 and then drops to zero. This increase probably reflects the accumulation of foreign debt by the country. In Philippines the risk premium initially reduces slowly and then collapses to zero. In South Korea, the financial risk premium is at very low levels from the start. Even the dotted line (which at 1984 assumes that only a 33.1% slice of the market value can be appropriated by foreigners) starts from only a 4.5% level. The only country for which the

<sup>10</sup> Although estimating the financial risk premium accurately is not possible, the aim of this analysis is to examine the changes in the financial risk premium as liberalisation policies were introduced. Therefore, a small bias in our results should not affect the analysis.



risk premium increases after liberalisation is India. This is probably the result of the very mild nature of reforms that were implemented in the country (see chapter 2). Another probable cause for the increase of India's risk premium, is the management of the funds it borrowed from abroad. A lot of the money borrowed were used either for welfare projects or for subsidies to favoured industries. Since the money were not used for productive purposes, it is expected that India's prospects deteriorated and future borrowing should come at a higher cost<sup>11</sup>. So, in India's case, it can be argued that liberalisation did not have any effect on the economy because it did not go far enough.

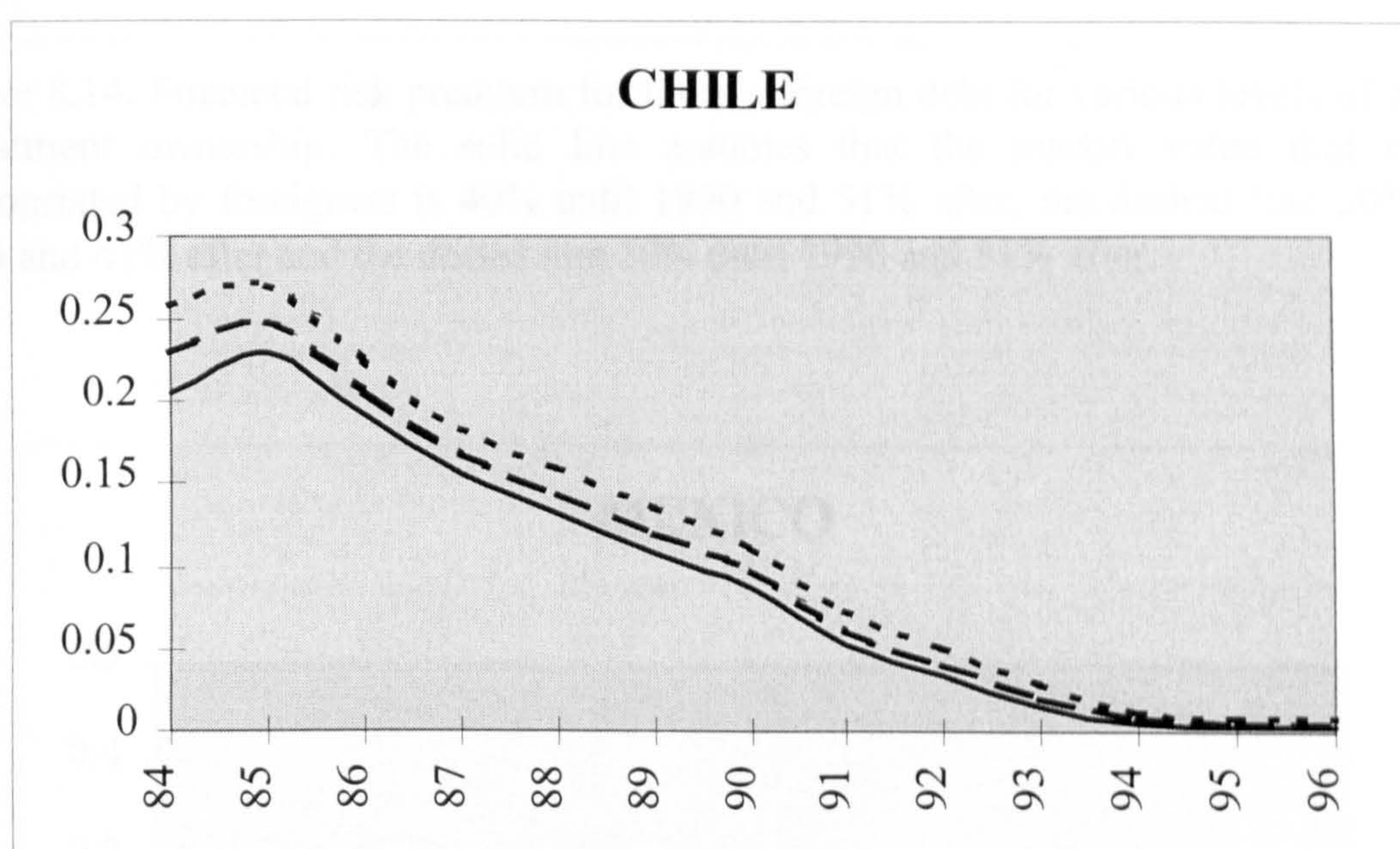


Figure 8.13. Financial risk premium for Chile's foreign debt for various levels of foreign investment ownership. The solid line assumes that the market value that can be appropriated by foreigners is 100%, the dashed line assumes a 90% and the dotted line assumes an 80%.

<sup>11</sup> see: Shapiro, A.C. (1985) and Cosset, J.C. and Roy, J. (1991).



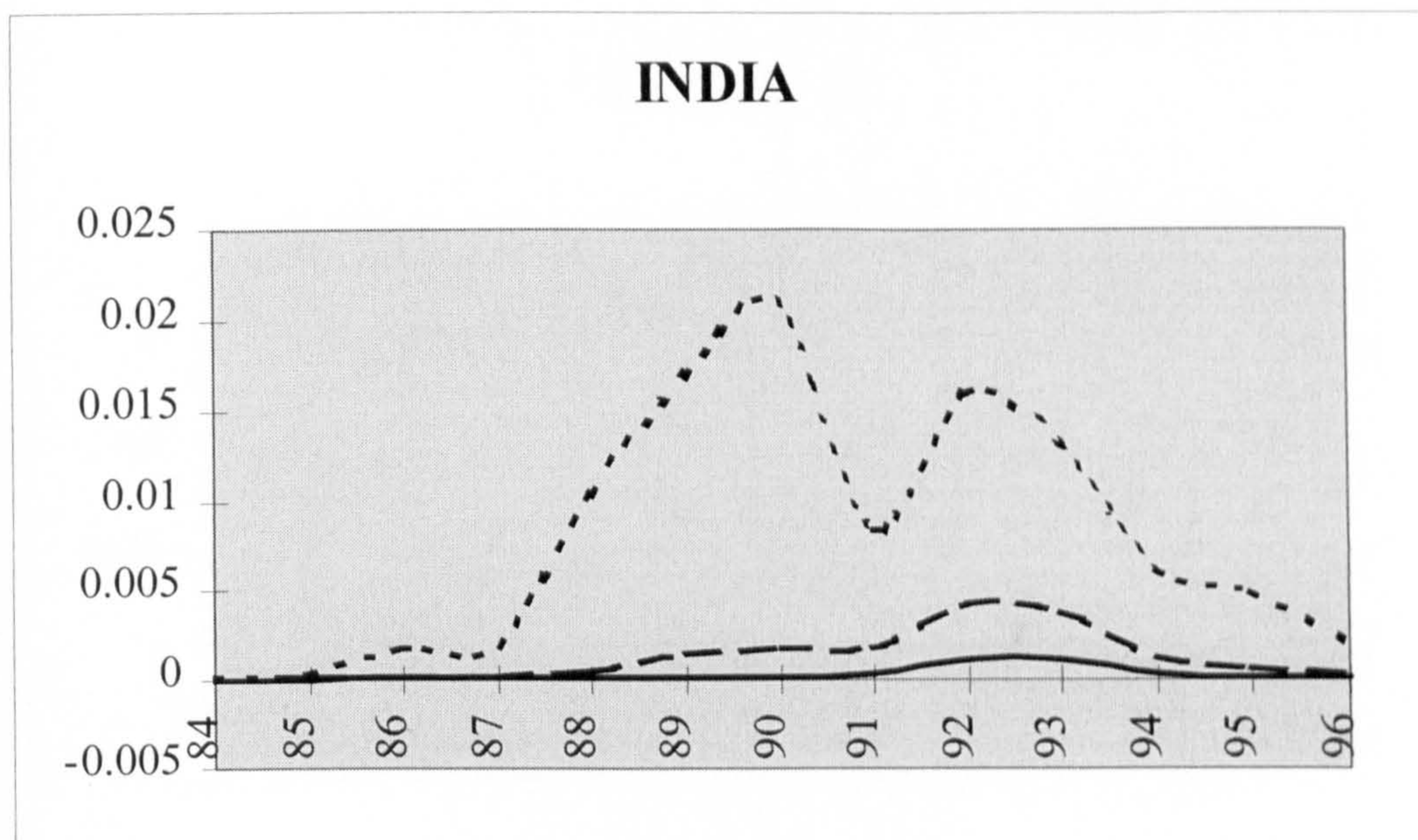


Figure 8.14. Financial risk premium for India's foreign debt for various levels of foreign investment ownership. The solid line assumes that the market value that can be appropriated by foreigners is 40% until 1990 and 51% after, the dashed line 30% until 1990 and 41% after and the dotted line 20% until 1990 and 31% after.

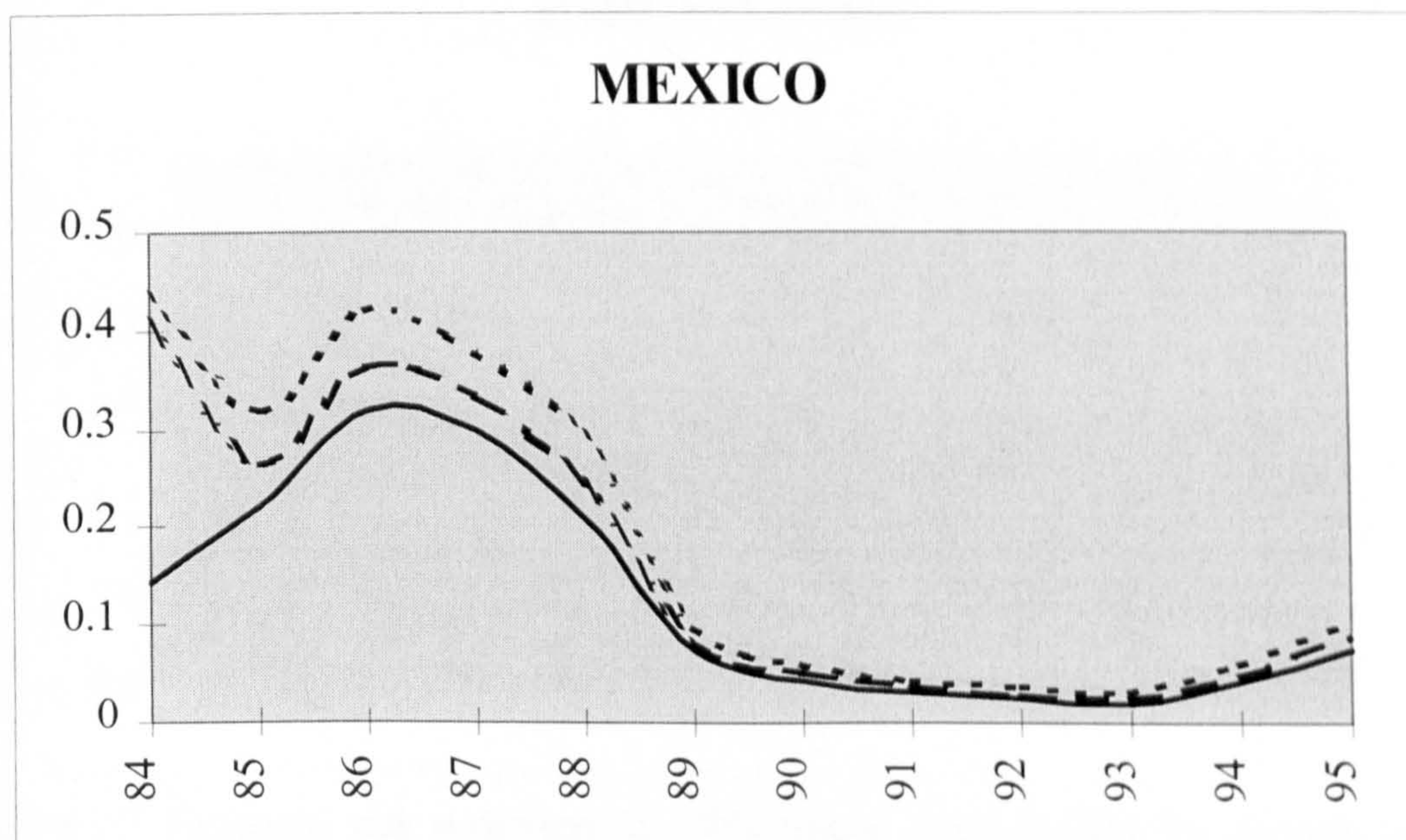


Figure 8.15. Financial risk premium for Mexico's foreign debt for various levels of foreign investment ownership. The solid line assumes that the market value that can be appropriated by foreigners is 49% until 1988 and 100% after, the dashed line 39% until 1988 and 90% after and the dotted line 29% until 1988 and 80% after.



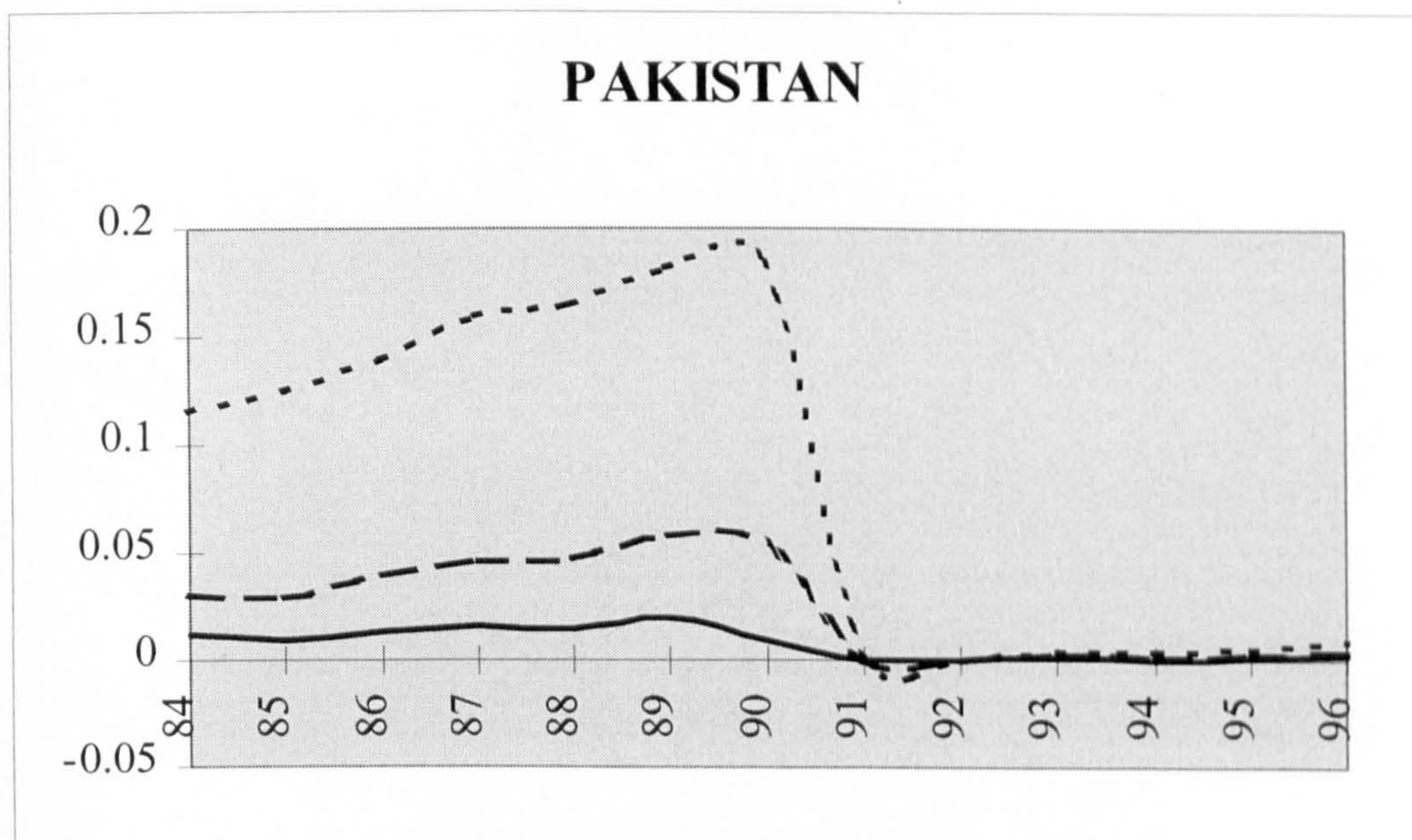


Figure 8.16. Financial risk premium for Pakistan's foreign debt for various levels of foreign investment ownership. The solid line assumes that the market value that can be appropriated by foreigners is 50% until 1990 and 100% after, the dashed line 30% until 1990 and 90% after and the dotted line 10% until 1990 and 80% after.

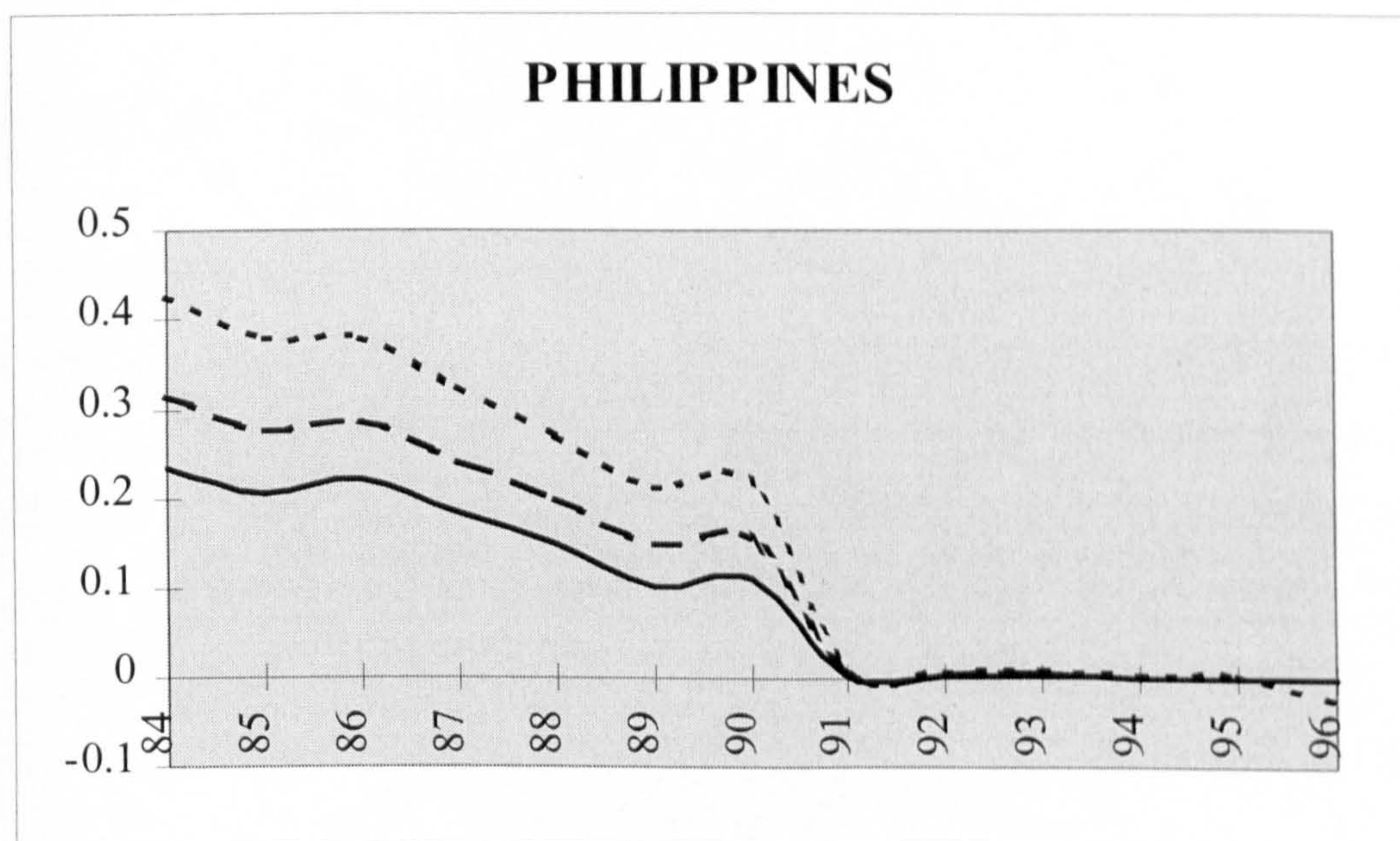


Figure 8.17. Financial risk premium for Philippines' foreign debt for various levels of foreign investment ownership. The solid line assumes that the market value that can be appropriated by foreigners is 40% until 1990 and 100% after, the dashed line 30% until 1990 and 90% after and the dotted line 20% until 1990 and 80% after.



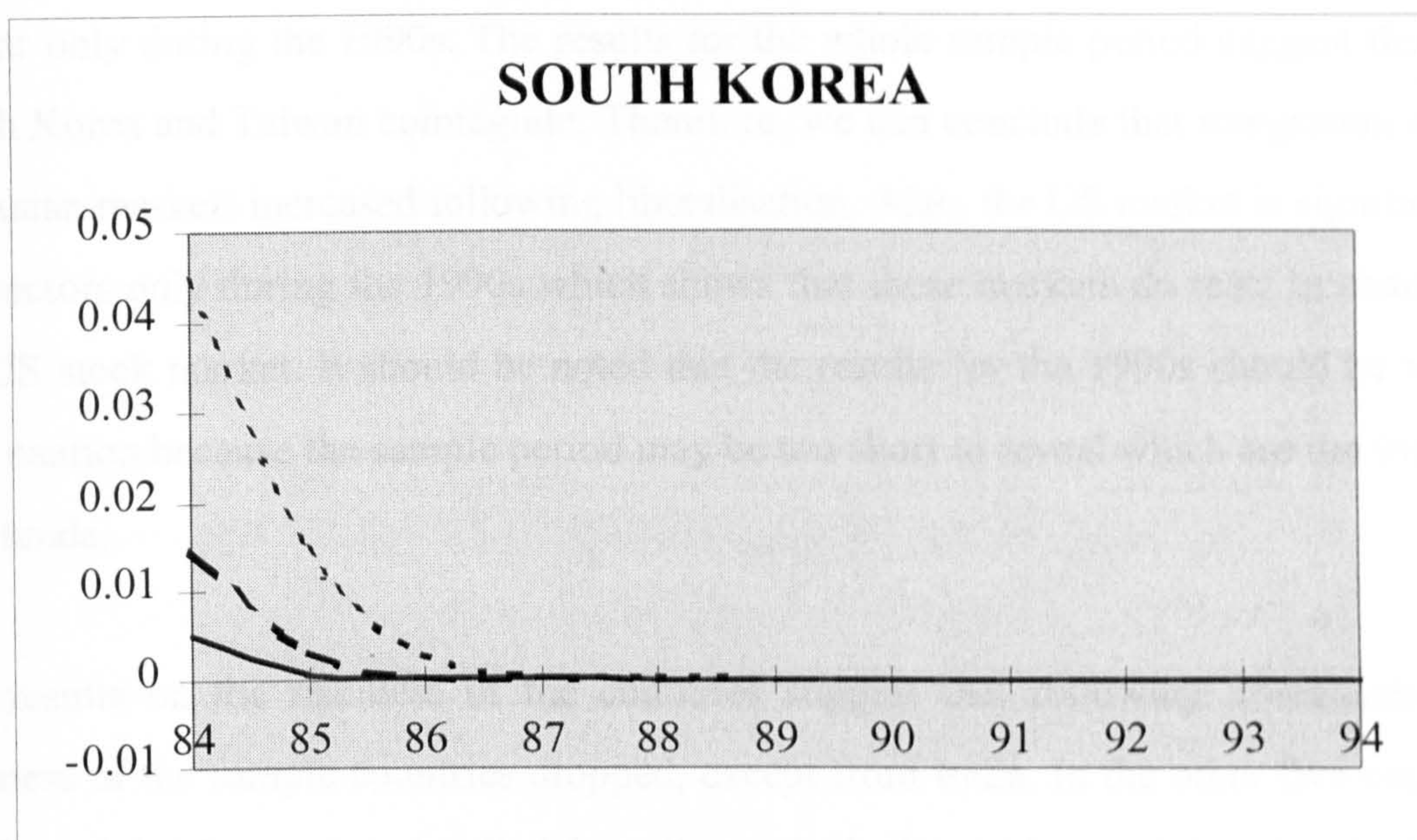


Figure 8.18. Financial risk premium for South Korea's foreign debt for various levels of foreign investment ownership. The ownership levels which the solid line represents are based on the percentage of liberalised sectors in the country<sup>12</sup>. The dashed line assumes 15% less than the solid line and the dotted line assumes 30% less than the solid line.

#### 8.4. Discussion of empirical results

The cointegration results showed increased integration among the Asian stock markets and increased segmentation among the Latin American markets after liberalisation. The Latin American stock markets all enter a cointegrating vector and it seems that until the 1990s each reacted to changes in the others. Also, they all cointegrate with the US stock market which indicates some degree of integration between the region and global stock markets. During the 1990s we failed to find any cointegrating relationships among these markets. These results suggest increased segmentation which could have many causes. One of the causes could be increased speculation.

The results for the Asian markets suggest the existence of two regions in the area. The Indian and the Pakistani stock markets follow one trend and the Philippines and Taiwan follow another. Also, the US stock market is cointegrated with both regions, which again signifies some degree of integration with the global markets. These relationships though,

<sup>12</sup> See appendix 5.



appear only during the 1990s. The results for the whole sample period suggest that only South Korea and Taiwan cointegrate. Therefore, we can conclude that integration among the Asian markets increased following liberalisation. Also, the US market is significant in the vectors only during the 1990s which shows that these markets do react in changes in the US stock market. It should be noted that the results for the 1990s should be viewed with caution because the sample period may be too short to reveal which are the true long run trends.

The results on the riskiness of the countries suggest that following liberalisation the riskiness of the sample countries dropped, except from India. In the other five countries, the financial risk premium implied from the analysis dropped to very low levels. We can conclude therefore, that financial liberalisation had a positive effect on five of the six countries in the sample. In the economic development literature, foreign investment is proposed as an alternative to debt for developing countries. This analysis shows that by freeing direct or indirect inwards investment, developing countries can, not only rely less on debt but enhance their position in the international credit market. Financial liberalisation made these countries less risky and as a result they could negotiate lower interest rates on their borrowing.

A prerequisite for the positive effects of liberalisation to materialise, seems to be that the developing economies use the money they borrow from abroad in productive projects. From the six countries in the sample, in four, the market value increased faster than their debt during the sample period. In all four countries, the financial risk premium fell following liberalisation. India, on the other hand, does not seem to use its borrowed funds in the most productive way. It could be that following liberalisation, the risk premium in India did not drop because the borrowed funds failed to increase the market value of the country. In this case, liberalisation cannot have a significant effect on the country's creditworthiness. The only result which is puzzling, is Pakistan's risk premium. Pakistan has historically borrowed heavily from abroad without any significant impact on its economic growth. During the last decade, several studies in the literature suggest that the country may be heading for insolvency. It is therefore puzzling to find that Pakistan's risk premium dropped to almost zero following liberalisation.

It should be noted that we do not claim that the financial risk premiums obtained from this study are accurate. It is unlikely that international lenders should demand the same interest rate from Philippines or Pakistan during the 1990's as from the US - the risk premium of the two countries is zero according to our results. The countries examined are developing countries and as such they carry more risk than developed ones. Even developing countries which have transformed their economies to market economies and have good prospects are inherently more risky than developed countries such as the US. Although the results obtained from this study may not be accurate, they are useful in demonstrating the effect that liberalisation policies had on the economies of the countries examined.

Taken jointly, the evidence presented in this chapter are mixed. Some seem to suggest increased integration with the world markets and some suggest increased segmentation following liberalisation. We believe that the most plausible explanation is the short sample period in the analysis. Stock market liberalisation was implemented fairly recently. It is reasonable to assume that it will take several years until the effect of these policies becomes apparent. So, even if liberalisation does have a uniform effect on all these countries with respect to integration, the data may be too few to show it.

## **8.5. Summary and Conclusions**

In this chapter we examined the effect of financial liberalisation with respect to integration among national stock markets. We used two methodologies, one to examine integration with respect to stock prices and one with respect to risk. The first procedure examines if the national stock markets follow a common trend. We tested for a common trend during the 1990s when most stock markets were liberalised and for another period prior to liberalisation, so we could compare the results from the two sample periods. The second methodology uses the options pricing formula to measure the value of the countries under examination that was held by residents. Following that, we calculated the financial risk premium on the countries' foreign debt that was implied by the countries' economic situation. From this analysis we were able to draw some conclusions.



It seems that liberalisation did not have a uniform effect on the countries examined with respect to integration. In fact, the results from the two methodologies seem to be contradictory. For the Latin American countries of our sample we failed to find a common trend followed by these countries indices. This indicates that the national stock markets in these countries became more segmented after liberalisation. The calculated risk premia however, indicate that both Chile and Mexico became safer for foreign investors during the later stages of liberalisation, indicating higher integration. These results seem to contradict each other. One likely explanation for this is that our sample period is rather short. This is further demonstrated by the results for the Asian countries. While for the whole sample period South Korea enters a cointegrating vector with Taiwan, for the shorter sample South Korea is insignificant in this vector. The results should therefore be treated with caution.

From the two methodologies, the calculation of the financial risk premium seems to provide us with a better insight on the changes in the level of integration of these economies with the US market. The risk premium schedule for its country follows a plausible trend given the economic history of its country during the sample period. The only implausible result is the level of the risk premium suggested by the analysis. This however, is probably just the result of high collateralisation levels used in the analysis.

In total, our results are not very helpful in providing us with an answer on whether the emerging stock market examined became more integrated with the world capital market or not. Our study helps more in highlighting the problems in this kind of analysis the most basic of which is data unavailability.

## **CHAPTER 9: SUMMARY AND CONCLUSIONS**

This thesis has attempted to provide some evidence on the effect of financial development on selected emerging economies. The focus of our analysis is on the development of stock markets in these countries. At the beginning of our discussion we presented an outline of the relevant theoretical approaches and their implications on the issues we examine. The development of the stock market in most emerging economies was the result of guidelines by the IMF and other international economic bodies. However, a clear theoretical model justifying the development of equity markets in these countries was lacking. One attempt at filling this gap was made by Cho (1986), but his analysis is based on some strong assumptions which do not necessarily hold. It is clear that stock market development in emerging economies preceded the theoretical justification for its development. A clear theoretical model incorporating the role of the stock market as well as the role of the banking sector within the economy and their contribution to growth has yet to be developed. The model by Boyd and Smith (1996) that we used for our analysis and is presented in chapter 3 attempts to address this problem. However, we feel that although the model is convenient for our purposes, it is very unlikely that it is based on realistic assumptions. The model is based on the assumption that as monitoring costs become higher due to increasing technological complexity, investors switch to projects which utilise observable return technology, so it is profitable for them to invest through the equity market. In reality though, none of the companies listed on the stock market use observable return technology and as investment become harder to monitor, investors will switch to debt instruments [Fry (1997)].

Even though the development of equity markets is not strongly backed by a relevant theory, several emerging economies went ahead with liberalisation policies which aimed at stimulating indirect investment both from residents and foreigners. Critics of this development argue that stock markets in these countries can only harm economic growth because they are inefficient, they fail to increase aggregate savings and they are excessively volatile which could undermine the entire economic system [e.g. Singh (1992)]. So, the existing theory is not very helpful in determining the benefits from



creating a stock market. The effect of the creation and development of stock markets in these economies is therefore, an empirical matter.

Empirical analysis of these issues is particularly important considering the development of the stock markets in these countries during the last twenty years. In chapter 2 we presented an overview of the development of the stock markets in selected countries as well as a discussion on the major economic changes in these countries during the last two decades. As we saw, the market capitalisation of both Latin American and Asian stock markets increased more than tenfold since the early 1980s. Value traded also increased more than tenfold during the same period. Considering the size of these economies, the money invested in their stock markets during the sample period should have a significant impact on their economic development. If the amount of money which found its way into the ESMs was indeed used for productive purposes, then these countries should experience much higher economic growth rates than before implementing stock market liberalisation. If, however, the predictions of the critics are true and all that money are simply chasing high short term returns damaging this way the stability of these economies, then economic growth should slow down or even become negative. Research in this area is especially important now, in the aftermath of the 1997 South East Asia crisis, when most of the Asian 'tigers' collapsed. There is a need to establish if the cause of the crisis was weak financial institutions or liberalisation itself.

Empirical research in this area is scarce and this thesis aims to contribute to this growing literature. Obviously, the changes in these economies the last two decades have created dozens of issues which require analysis. In the present analysis, we concentrate on three of these issues. We examine the effect of stock market development on selected emerging economies and its relationship to the banking sector, changes in stock market volatility before and after liberalisation and changes in integration between the ESMs and the international capital markets.

With respect to the first issue, most studies in the field concentrate on the effect of either stock markets or banks on economic growth, but not both at the same time. We believe that if stock markets provide different services to banks and if they have become an

important part of the financial system of these countries, then both should be included in the analysis in order to identify the separate effect of each on economic growth. The methodology most studies in the field use is cross country regressions. Very few studies utilise time series analysis to examine this issue [e.g. Arestis and Demetriades (1997)]. The problem with cross country regressions is that by aggregating data, valuable information is lost. We believe that not all countries which developed stock markets were affected in the same way. Surely, the structure of their markets, the level of development, the openness of their economies and other features should be fairly important in the functioning and the usefulness of a stock market. However, when aggregating data these special features are lost. We feel that time series analysis of individual countries is more appropriate. Even when we do not explicitly account for these features in the regressions [by means of a repression index as in Arestis and Demetriades (1997) or otherwise] the results should give us an indication as to the usefulness of a stock market under different conditions.

The methodology we have utilised is the Johansen cointegration analysis which provided us with evidence about the relationship between the financial sector and the real economy. We only derive the reduce form equations and we do not model the short run dynamics. The long run solution of the system should provide us with information on the interactions between the financial sectors and the real economy as well as between the two financial sectors. In the regressions we also include a stock market volatility variable to account for the negative effect predicted by the critics of the liberalisation thesis.

The results present some evidence that the Latin American countries we examined, namely Chile and Mexico, have benefited from the development of a stock market. On the other hand, in the Asian economies of our sample, there seems to be no direct effect from the stock market to the economy, except from South Korea. The difference between the Latin American countries and the Asian countries in our sample is the degree of liberalisation that these countries implemented. Chile and Mexico, liberalised their economies almost completely, while India, South Korea and Taiwan kept several restrictions with respect to foreign investment. Our results suggest therefore, that a stock market can be a source of growth if an economy is sufficiently liberal. In financially



repressed economies (or less liberal economies), we could not find any evidence that the stock market assisted economic growth. Several reasons could be the cause of that, like the distortion of prices which do not allow the stock market to act as a pricing instrument, or speculation. Whatever the cause, the evidence seem to support that a stock market can be effective where market forces are allowed to operate. However, we cannot dismiss the advocates of government intervention because of the results for South Korea. South Korea was until recently recognised as an economic miracle. Its development was the result of government planning. Our results suggest that the government was successful in using both the stock market and the banking sector to promote economic growth. However, the exogeneity of both financial sectors, indicates that they failed to develop with the economy, which could be the reason behind the recent collapse of the South Korean economy.

The evidence for the banking sector suggest that it failed to assist economic growth in most of the countries of our sample. The most interesting cases are those of Chile and Mexico where the banking sector is actually shown to impede economic development. The most plausible explanation for this is the banking crises these countries experienced during the early 1980s. At that time, banks in the two countries were left to regulate themselves and they failed to do so, taking excessive risks and adopting bad practices. Our results confirm the need for tight government regulation and control. For the Asian economies, we find some evidence that the banking sector has a positive effect on the economic growth of South Korea and Taiwan. Although in these two countries the banking sector seems to make a positive contribution to the real economy, the banking sector itself is not endogenous in the economic system. In other words, the banking sector did not develop with the economy.

With respect to the volatility of the stock market, we failed to find any evidence that it harms economic growth, except for Chile. This is evidence against the critics of the liberalisation thesis, since the stock markets of the countries we examine have frequently been described in the literature as excessively volatile. In three out of the four countries of our sample where stock market volatility was included it is not negatively related to the real economy. Therefore, we can conclude that either stock market volatility does not

affect economic growth or that the volatility of these market was not high enough to become harmful to the real economy. This is the subject of our second test.

The second issue we examine is the change in stock market volatility before and after liberalisation. Stock market volatility is important because it can undermine the whole economic system (although in our tests it has not been apparent). The argument often seen in the literature is that volatility would increase once these markets are liberalised because investors would use these markets for making a quick profit in the short term.

To examine the issue we employed two tests which complement each other. The GARCH process was used because it has been established as one of the best instruments for modelling the volatility of financial series. The EGARCH process was used to account for the sign effect, i.e. the difference in volatility caused by good and bad news of the same magnitude.

The first set of tests we conducted to examine volatility is on the change of the parameters of a GARCH process before and after liberalisation. The results suggest that past news cause less volatility in stock prices after liberalisation than before and that old news (i.e. news from two periods ago and before) cause more volatility after liberalisation than before. The constant of the GARCH process (which is a measure of the unconditional volatility) is lower for most countries after liberalisation and the degrees of freedom of the models rise after liberalisation.

The second set of tests we conducted is to examine the change in the news impact curve implied by an EGARCH process fitted in the data. The news impact curve relates past news to current volatility. A flat curve suggests low volatility for both 'big' and 'small' news. For all countries except from Pakistan and Philippines, the news impact curve after liberalisation is either flatter or starts from a lower point than before liberalisation, or both. This evidence indicate lower levels of volatility after the markets opened up to foreign investors.



On the whole, the results indicate that the markets in our sample have a longer memory after liberalisation but the level of volatility seems to be lower. The only exception is Mexico, where the results indicate that not only the level of volatility but the memory of the market has reduced as well. Overall, the results suggest that liberalisation did not have the negative effect on volatility that economists feared and some researchers have found [e.g. Aitken (1996), Grabel (1995)]. On the contrary, it seems that volatility may have fallen after liberalisation.

The third empirical chapter, provides evidence as to the change in the degree of integration after liberalisation policies were implemented. Integration of ESMs with the world capital markets is important because it should improve the efficiency and enhance the role of stock markets in these economies. Integration implies that domestic assets are priced in the world market. This should help an economy direct funds towards the most productive projects and become more competitive in the world market. Integration also implies that there are no risk premia because of barriers so the required return from investment falls in line with similar projects in other countries.

We examined changes in integration in two ways. First we examined integration of the national stock indices. This was tested using a cointegration test [as in Kasa (1992)]. The results for Latin America suggest that the three markets included in the analysis were integrated during the 1980s but became segmented during the 1990s. Also, it seems that the markets were also integrated with the American market which implies integration with the global market. The results for the Asian stock markets provided the opposite results. Cointegration before liberalisation was accepted only for two countries and rejected for the US market. After liberalisation, we found the existence of two regional groups which followed a common trend. Both regional groups were also cointegrated with the US market.

The second test for integration, examined the convergence of the riskiness of each market to that of the US. The methodology we utilised is used in the country risk literature. We estimated the financial risk premium implied by the macroeconomy of each country every year of our sample period, and examined if it is falling year by year. The results

showed that, except from India, the financial risk premium on the foreign debt of every country in our sample became lower towards the end of the sample period. In the case of Mexico, Pakistan and Philippines, the risk premium fell sharply after the most important policies were introduced. In Chile, the risk premium fell steadily after 1985, and in South Korea, it became almost zero after 1985. Only in India the risk premium rose towards the end of the 1980s. Considering that India is the country in our sample with the most restrictive policies towards foreign investment, we could interpret the results as evidence in favour of the benefits of financial liberalisation.

The two tests for integration provide mixed results. It is not clear whether the Latin American countries in our sample became more or less integrated. For the Asian markets, the results indicate a higher degree of integration after liberalisation. However, India's riskiness seems increased during the latest stages of our sample period although we find that it cointegrates with the US market. One possible explanation is that the Indian stock market is not representative of the Indian economy.

Taken together, our results fail to support the fears of the critics of stock market liberalisation. Having said that, we should note that it may not always be the case that the development of a stock market can help economic growth. As it is demonstrated by the results of our first test, it seems that to make a stock market a source of growth, a country would have to implement economy-wide liberalisation policies. Alternatively, it could try developing a stock market under financial repression (or near financial repression), but it would have to be very good at managing the economy, like the South Korean government. If it cannot do that, the stock market will probably be a waste of resources (like in India and Taiwan).

The consolation for the advocates of financial liberalisation, is that even if the development of the stock market is not helpful, it will not be harmful either (at least not in the sense that Keynesian economists predict). The results for the effect of volatility on economic growth and from chapter 7 indicate that stock market volatility does not really harm economic growth and has not risen after liberalisation. The results presented here



are evidence against the predictions that volatility will follow stock market development and the economy will be destabilised.

Finally, it is not clear if liberalisation has helped ESMs integrate with the world capital markets. The two tests we carried out provided contradictory results. We feel that the results from the cointegration regression are rather suspicious in light of the previous results. In chapter 6 we saw that Latin American stock markets were the ones which are positively related with economic growth. Considering that these markets were opened to foreign investors and their economies liberalised a lot more than in the Asian countries, we expected that the Latin American stock markets would show a higher degree of integration after liberalisation. Our results however show exactly the opposite. This of course, could simply mean that liberalisation does not work. It could be the case that the liberalised stock markets attracted a lot of money but for various reasons (e.g. increased speculation) they failed to integrate with the world market. Another explanation could be that our sample period is rather short and this distorts the results.

The second test for integration shows however, that in both Chile and Mexico the risk premium fell after liberalisation. This indicates a higher degree of integration which taken together with the previous results means that stock market development in Latin America was successful. The only problem could be the negative effect of stock market volatility on economic development found in Chile, but since volatility did not increase following liberalisation, we cannot take this as evidence against it. The same test also shows that the financial risk premium fell for the Asian countries as well, except India. This result, together with the results from chapter 7, indicate that the Asian market included in the analysis in these two chapters became less risky which could be a result of higher integration with the world markets.

Having discussed the possible interpretations for our results, we should warn that the evidence presented here should be viewed with caution. Our study has several limitations which could distort the evidence presented. The most important problem is the limited amount of data available. Our data cover about twenty years. A longer sample period may be required in order to appreciate the effect of financial liberalisation and stock market

development on the emerging economies. In most countries, the reform policies were implemented less than ten years ago, and it may take more than that for the benefits or problems of liberalisation to materialise.

Another problem is that the data we used for our analysis are aggregate data. These may conceal several features which could affect our results. In order to examine the effect of the financial sectors on the economy, disaggregate data would be more helpful. Unfortunately, such data are not available yet. Especially with respect to the stock market, disaggregate data for these countries would be much more relevant. Several of the stock markets examined here, are relatively small and they tend to be dominated by few large companies. It would be more useful to examine the development of the part of the stock market which refers to private industries and test its effect on the industries it represents. The same limitation applies to the tests for volatility. If the market is dominated by a few large companies which tend to be relatively inactive then, our estimates will underestimate the true changes in volatility. Again, disaggregation of the data would provide a clearer picture of the effect of liberalisation of the stock market in these countries. The same applies to the test for integration. Disaggregated data and a longer sample period would probably provide better estimates of the relationships in these markets.

Also, to make valid inferences about whether stock market liberalisation has affected the developing countries and under which conditions it is more likely to succeed we should have more countries in our sample. Unfortunately, the quality and unavailability of data for other emerging markets prevented us from including other countries in our sample.

The limitations of this study, point to future research needed in this area. A lot more research is needed on the effects of the financial sector on the economy in developing countries, considering that there are hardly any such studies. Research in this field should become easier as more data becomes available. Research should examine the effect of financial development not only on a national level but on individual industries as well. This is particularly important for the developing countries as some sectors of the economy are either public or are not represented in the stock market. Another aspect



which has hardly been examined is the importance of channels of finance other than banks and the stock market (e.g. credit houses in Taiwan and pension funds in Chile). There are hardly any studies in the literature which examine their importance in the economy and their impact on economic development. However, until data are available this will not be possible. It is also important to examine the channels through which stock market development affects economic growth. This will require specific modelling of the individual channels, but it is doubtful if enough data are available to allow a proper time series analysis of these issues.

Further research on developing stock market volatility and volatility models in general is also needed. The ARCH family of processes we use is one of the best tools available to measure volatility but it lacks theoretical justification. It is therefore, difficult to explain how volatility changes based on our findings. Advances in the econometric tools for volatility are needed not only to measure volatility but also to explain why it changes. For the developing countries, researchers should look at disaggregate data to measure volatility, especially since these markets are very concentrated in terms of market capitalisation and trading activity.

Despite its limitations, we feel that this thesis has made a positive contribution to the analysis of issues of interest in emerging economies. Such studies are of vital importance for these economies because of the developments there during the last two decades. Our work sheds some light to the importance of the stock market development in some emerging economies and adds to this growing literature.

## APPENDIX 1

### Ratio to moving technique for seasonal adjustment

The first step is to take a moving average of the data that spans a year. Since our data are monthly observations we take a 12-month moving average. Next, the ratio of the raw data to the moving average is formed. This is a preliminary seasonal index. To find the unadjusted seasonal factor for each month, we find the average for each month from the seasonal index, i.e. the average of all the values for January from the index, the average for all values for February, etc. Theoretically, the sum of these seasonal factors should add up to 12. Because in practice they do not, we calculate an adjustment factor by dividing 12 by the sum of the unadjusted seasonal factors. We then multiply the adjustment factor with each of the unadjusted seasonal factors to obtain the adjusted seasonal factors for each month of the year. Thus, we have a seasonal factor for each month with which we multiply our raw data to obtain the seasonal adjusted series. For a discussion on this method and an example, see: Brown 1991.



## APPENDIX 2

### Unit root tests

To determine the appropriate lag length of the ADF test, we use the Akaike Information Criterion and the Schwarz Bayesian Criterion. If there is a difference in the order of the ADF test chosen by the two criteria, then we choose the ADF test with the most lags. We prefer a long lag structure because the data are monthly observations. The critical value is -2.87. The tests presented here include a constant and no trend. We have run the tests including a trend and the results do not change.

The variables are:

LINDPR : Logarithm of industrial production index

LMV : Logarithm of deflated stock market capitalisation

LM2 : Logarithm of deflated M2 money supply (for Taiwan only)

LCR : Logarithm of deflated credit given to private enterprises by banks

LVOL : Logarithm of stock market volatility

and the variables beginning with D are their first differences.

### Chile

	LINDPR	LMV	LCR	LVOL	DLINDPR	DLMV	DLCR	DLVOL
Statistic	-1.62	-0.7	0.66	-1.99	-7.76	-10.64	-6.10	-5.66
Lags	12	1	8	12	2	1	2	12

### India

	LINDPR	LMV	LCR	LVOL	DLINDPR	DLMV	DLCR	DLVOL
Statistic	0.73	-0.59	-2.37	-1.48	-4.79	-9.89	-4.36	-7.00
Lags	12	2	11	12	11	1	10	11

Mexico

	LINDPR	LMV	LCR	LVOL	DLINDPR	DLMV	DLCR	DLVOL
Statistic	-1.52	-0.53	-1.09	-2.82	-8.43	-15.65	-4.44	-13.90
Lags	3	1	12	3	2	0	11	0

South Korea

	LINDPR	LMV	LCR	LVOL	DLINDPR	DLMV	DLCR	DLVOL
Statistic	-1.22	-1.14	-0.74	-5.36	-3.38	-4.79	-3.51	
Lags	12	5	12	12	11	4	11	

Taiwan

	LINDPR	LMV	LM2	LVOL	DLINDP R	DLMV	DLM2	DLVOL
Statistic	-1.22	-0.82	-0.69	-2.00	-13.70	-7.51	-3.87	-5.66
Lags	3	3	6	12	2	2	5	11



### APPENDIX 3

Determining cointegration rank and the model for deterministic components.

#### Chile

##### Trace statistic

Null	Model 1		Model 2		Model 3	
Hypothesis	Statistic	Critical Value	Statistic	Critical Value	Statistic	Critical Value
$p = 0$	58.88**	53.48	38.62	48.88	54.81	63.00
$p \leq 1$	35.77**	34.78	16.93	31.54	32.92	42.34
$p \leq 2$	16.10	20.18	6.15	17.86	15.96	25.77
$p \leq 3$	5.37	9.16	0.78	8.07	5.24	12.39

##### Maximal eigenvalue statistic

Null	Model 1		Model 2		Model 3	
Hypothesis	Statistic	Critical Value	Statistic	Critical Value	Statistic	Critical Value
$p = 0$	23.11	28.27	21.68	27.42	21.89	31.79
$p \leq 1$	19.67	22.04	10.78	21.12	16.96	25.42
$p \leq 2$	10.73	15.87	5.37	14.88	10.72	19.22
$p \leq 3$	5.37	9.16	0.78	8.07	5.24	12.39

-\* and \*\* indicate significance at the 10% and 5% level respectively.

-Critical values reported are for the 5% level of significance.

Using the trace statistic, we find two cointegrating vectors and the appropriate model has restricted intercepts and no trends.

**India**

**Trace statistic**

Null Hypothesis	Model 1		Model 2		Model 3	
	Statistic	Critical Value	Statistic	Critical Value	Statistic	Critical Value
$p = 0$	51.47*	53.48	40.88	48.88	57.20	63.00
$p \leq 1$	31.55	34.78	20.96	31.54	33.38	42.34
$p \leq 2$	16.70	20.18	7.81	17.86	13.75	25.77
$p \leq 3$	7.20	9.16	0.49	8.07	6.29	12.39

**Maximal eigenvalue statistic**

Null Hypothesis	Model 1		Model 2		Model 3	
	Statistic	Critical Value	Statistic	Critical Value	Statistic	Critical Value
$p = 0$	19.92	28.27	19.92	27.42	23.82	31.79
$p \leq 1$	14.85	22.04	13.14	21.12	19.63	25.42
$p \leq 2$	9.50	15.87	7.33	14.88	7.46	19.22
$p \leq 3$	7.20	9.16	0.49	8.07	6.29	12.39

-\* and \*\* indicate significance at the 10% and 5% level respectively.

-Critical values reported are for the 5% level of significance.

There is one cointegrating vector (at the 10% significance level). The appropriate model is Model 1 (restricted intercept and no trends).



**Mexico**

**Trace statistic**

Null	Model 1		Model 2		Model 3	
Hypothesis	Statistic	Critical Value	Statistic	Critical Value	Statistic	Critical Value
$p = 0$	<b>52.93*</b>	53.48	43.97	48.88	<b>60.39*</b>	63.00
$p \leq 1$	17.00	34.78	13.87	31.54	30.11	42.34
$p \leq 2$	5.36	20.18	4.30	17.86	12.69	25.77
$p \leq 3$	1.23	9.16	0.71	8.07	3.41	12.39

**Maximal eigenvalue statistic**

Null	Model 1		Model 2		Model 3	
Hypothesis	Statistic	Critical Value	Statistic	Critical Value	Statistic	Critical Value
$p = 0$	<b>35.94**</b>	28.27	<b>30.10**</b>	27.42	<b>30.28*</b>	31.79
$p \leq 1$	11.64	22.04	9.57	21.12	17.43	25.42
$p \leq 2$	4.13	15.87	3.59	14.88	9.28	19.22
$p \leq 3$	1.23	9.16	0.71	8.07	3.41	12.39

-\*\* and \* indicate significance at the 5% and 10% level respectively.

-Critical values reported are for the 5% level of significance.

Using the trace statistic we can find one cointegrating vector using Model 1 or Model 3. Therefore, we accept that there is one cointegrating vector. To determine which model we should choose, we consider the results using the maximal eigenvalue criterion. With this criterion, the suggested Model and rank are Model 1 and rank 1. So, we accept that there is one cointegration vector and the appropriate model has restricted intercept and no trends.

South Korea

Trace statistic

Null	Model 1		Model 2		Model 3	
Hypothesis	Statistic	Critical Value	Statistic	Critical Value	Statistic	Critical Value
$p = 0$	42.30**	34.87	31.73**	31.54	47.01**	42.34
$p \leq 1$	14.18	20.18	3.78	17.86	17.41	25.77
$p \leq 2$	1.85	9.16	0.42	8.07	3.35	12.39

Maximal eigenvalue statistic

Null	Model 1		Model 2		Model 3	
Hypothesis	Statistic	Critical Value	Statistic	Critical Value	Statistic	Critical Value
$p = 0$	28.11**	22.04	27.96**	21.12	23.82	31.79
$p \leq 1$	12.34	15.87	3.36	14.88	19.63	25.42
$p \leq 2$	1.85	9.16	0.42	8.07	7.46	19.22

-\* and \*\* indicate significance at the 5% and 10% level respectively.

-Critical values reported are for the 5% level of significance.

We compare the statistics with their critical values starting from Model 1 and rank 0, going to Model 2 and rank 0 and then Model 3 and rank 0. We then go to rank 1 and carry on from the most restrictive to the least restrictive model. The first time the null is not rejected is for Model 1 using the trace statistic. Therefore, we accept that the correct specification is the one suggested by Model 1 (restricted constant and no trend in the cointegration vector) and we accept that there is one cointegration vector. As was discussed before, the trace statistic is more robust than the max-eigenvalue statistic and since the two tests produce different results, we use the trace statistic.



Taiwan

Trace statistic

Null	Model 1		Model 2		Model 3	
Hypothesis	Statistic	Critical Value	Statistic	Critical Value	Statistic	Critical Value
$p = 0$	84.91**	53.48	66.90**	48.88	75.81**	63.00
$p \leq 1$	36.97**	34.87	27.11	31.54	31.06	42.34
$p \leq 2$	15.86	20.18	6.04	17.86	9.91	25.77
$p \leq 3$	4.51	9.16	0.73	8.07	1.95	12.39

Maximal eigenvalue statistic

Null	Model 1		Model 2		Model 3	
Hypothesis	Statistic	Critical Value	Statistic	Critical Value	Statistic	Critical Value
$p = 0$	47.95**	28.27	39.80**	27.42	44.75**	31.79
$p \leq 1$	21.11*	22.04	21.07*	21.12	21.16	25.42
$p \leq 2$	11.36	15.87	5.30	14.88	7.96	19.22
$p \leq 3$	4.51	9.16	0.73	8.07	1.95	12.39

-\* and \*\* indicate significance at the 10% and the 5% level respectively.  
-Critical values reported are for the 5% level of significance.

The tests suggest the existence of one cointegrating vector and the appropriate model is Model 2.

## APPENDIX 4

The *World Debt Tables* report among other things a projection on the payments of the outstanding long term debt of each country for the next ten years after the year for which the data are presented. For example, the debt tables for 1996 report the payment schedule of all countries from 1997 to 2006. However, the debt of several countries has a maturity longer than ten years. Therefore, in order to get a more accurate picture of the debt outstanding we have to estimate payments beyond the ten year period. We should state from the beginning that an accurate estimation of the remaining debt is impossible because the debt originates from several different sources and each source has an individual arrangement with the country-debtor for repayment. Since information on the individual repayment arrangements is not available, it is impossible to accurately calculate the amount of money that every country will pay each year beyond the ten year period.

The World Debt Tables include information on the average maturity, interest rate and grace period of the debt undertaken each year by every country. From this information we are able to deduce the amount of debt that will extend beyond the ten year period, the interest rate paid on that debt and how many years it will take for the debt to be repaid.

For example, in 1996, Chile total long term debt was \$20,421 million and the undisbursed debt (debt which Chile had not borrow yet but would borrow in the future) was \$961 million. The repayment projection showed that within the next ten years (i.e. from 1997 to 2006), Chile would repay \$19,028 million of the principal plus interest. Therefore, assuming that Chile would use the undisbursed debt, it would still have to repay principal of \$2,354 ( $20,421 + 961 - 19,028$ ) after the year 2006.

The next piece of information we use is the maturity of the debt for 1996 and the previous years. For example, in 1995, the average maturity of Chile's debt was 18 years, with a grace period of 5.4 years. This means that Chile would make payments on the new debt it acquired in 1995 until the year 2017; in other words, Chile would have to make 11 more



payments after 2006, to repay the debt it acquired in 1995. In the same way, we calculate how long it takes Chile to repay debt from previous years so, we find into how many payments the \$2,354 still owned is divided. Our calculations for Chile showed that it would have to make 11 payments for its 1995 new debt (i.e. from 2007 to 2017), 6 more payments for the 1994 new debt, 2 more payments for the 1993 new debt, 11 more payments for the 1992 new debt, 3 more payments for the 1991 new debt, 5 more payments for the 1990 new debt and 3 more payments for the 1989 new debt; a total of 41 payments spanning from 2007 to 2017. At this point we assume that all these payments are equal. So, each payment is \$57.415 million ( $2,354 / 41$ ). Since this is only the principal repayments, we still have to calculate the interest payments. From the World Debt Tables, we know the average interest rate on every year's new debt. The average interest rate on the debt acquired in 1995 was 6.2%. We assume that interest payments are spread equally each year. So, in 2007, Chile would have to repay \$57.415 million for its 1995 new debt and \$3.56 million in interest. The same year it would have to pay another \$344.49 million ( $57.415 \times 6$ ) for principal repayments for the debts acquired from 1989 to 1994, plus interest on these payments.

We understand that the results obtained with this method are inaccurate. The debt for these countries is amortised, therefore, neither principal repayments, nor interest payments will be equal every year. Furthermore, it is highly unlikely that all the debt acquired in 1995, for example, will mature in 2017. However, with the available data, it is impossible to get a precise estimate of the payments that will take place into the future. It should also be noted, that the estimated payments count very little towards the estimation of the total debt because they take place far into the future so they will be discounted with high discounting factors. Anyway, getting an imprecise estimate of the repayments in the distant future is better than ignoring them, since some of the debt examined has a very long maturity. In this case a significant proportion of the debt would be unaccounted for.

## **APPENDIX 5**

South Korea opened up its economy to foreign investors gradually. During the sample period, almost every year the South Korean government made more sectors available to foreign investors. Since data to estimate the proportion of each sector in the economy are not available, the liberalisation ratio that we use in the analysis, is the proportion of the industries open to foreign investors. These are as follows:

In 1984, 660 out of 999 industries were open to foreign investment. In the remaining industries, approval was required for a majority foreign participation. The liberalisation ratio we use in the analysis is 66.1%.

In 1985, the number of industrial sectors accessible to foreign investors increased to 762. The liberalisation ratio we use for 1985 and 1986 is 76.3%.

In 1987, the number of industrial sectors accessible to foreign investors increased to 788. The liberalisation ratio we use for 1987, 1988 and 1989 is 79%.

In 1990, the number of industries open to foreign investment increased to 793. The liberalisation ratio we use for 1990 and 1991 is 79.4%.

In 1992, the number of industries liberalised was 926 out of a total of 1,148 industries and the ratio we use is 80.7%.

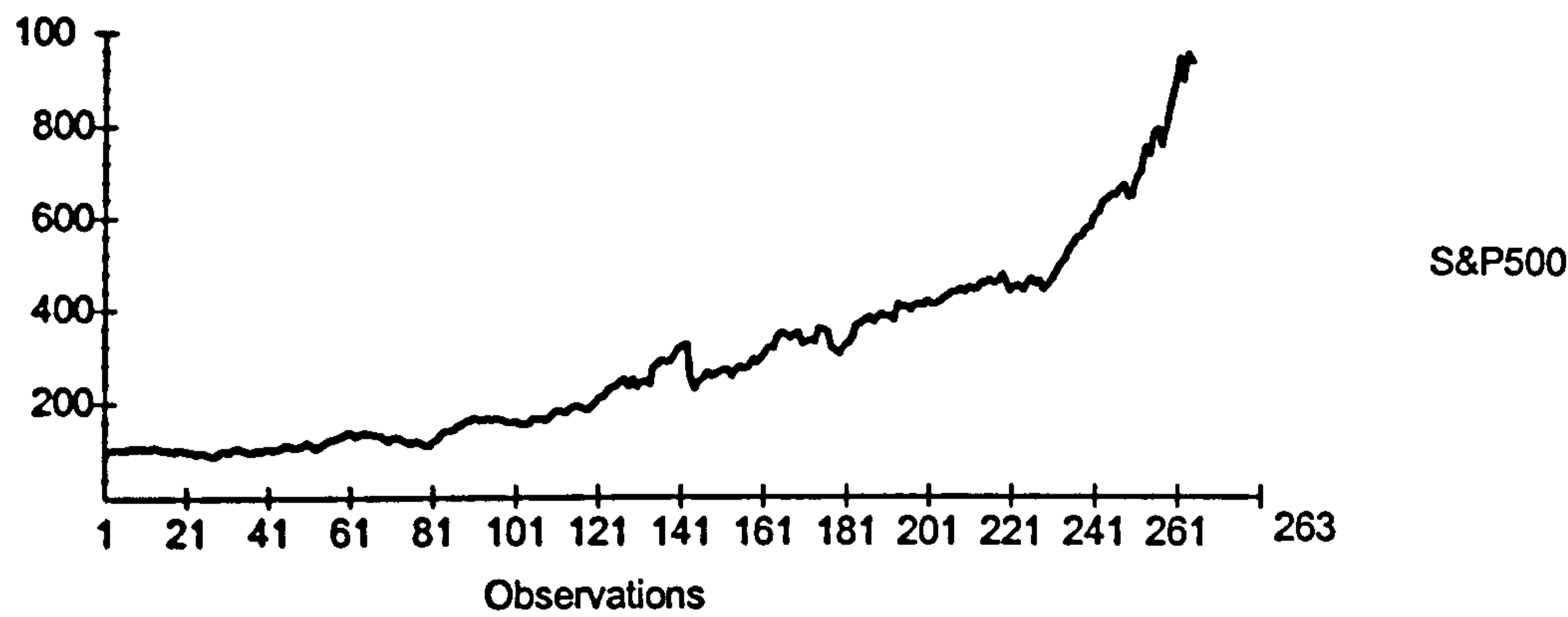
In 1993, the number of industries liberalised was 940 out of a total of 1,148 industries and the ratio we use is 85.1%.

Finally, in 1994, the number of industries liberalised was 1040 out of a total of 1,148 industries and the ratio we use is 90.6%.

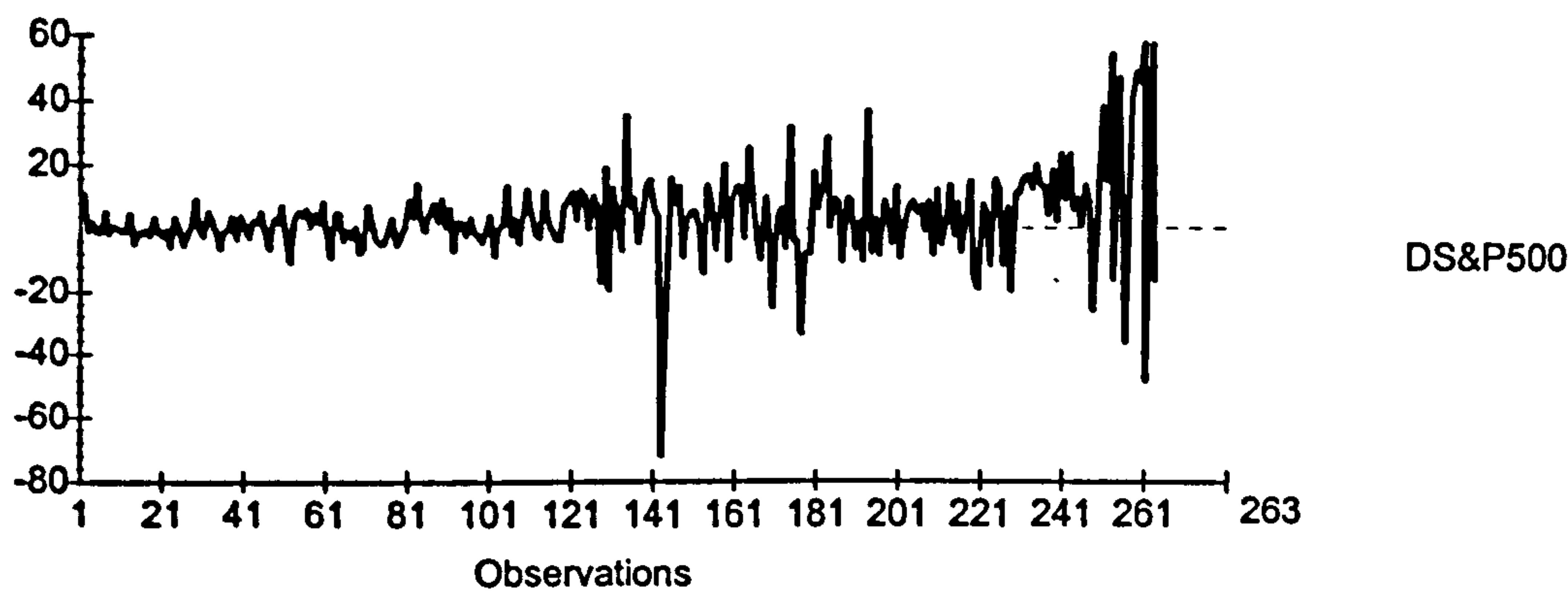


APPENDIX 6

Plot of Standard & Poor's 500 Index and its first difference



It is clear that the level of the S&P500 index is not stationary.



The difference of the series appears to be stationary.

## References

Aggarwal, R. and Rivoli, P. (1989) Seasonal and day-of-the-week effects in four emerging stock markets., *The Financial Review*, Nov., vol. 24, no. 4, p. 541.

Aitken, B. (1996) Have Institutional Investors Destabilised Emerging Markets?, *IMF Working Paper*, April.

Akyuz, Y. (1992) On Financial Deepening and Efficiency, *UNCTAD*, Discussion Paper no. 43, February.

Akyuz, Y. and Kotte, D.J. (1991) Financial policies in Developing Countries: Issues and Experience, *UNCTAD*, Discussion Paper no. 40, August.

Akyuz, Y. (1991) Financial Liberalisation in Developing Countries: A Neo-Keynesian Approach, *UNCTAD*, Discussion Paper no. 36, March.

Amsden, A.H. and Euh, Y.D. (1993) South Korea's 1980s financial reforms: good-bye financial repression (maybe), hello new institutional restraints?, *World Development*, vol. 21, no. 3, pp 379-90.

Arestis, P. and Demetriades P. (1997) Financial development and economic growth: Assessing the evidence, *The Economic Journal*, 107, May, pp.783-799.

Arestis, P. (1992) *The Post-Keynesian Approach to Economics: An Alternative Analysis of Economic Theory and Policy*, Aldershot: Edward Elgar.

Arestis, P. (ed.) (1988) *Post-Keynesian Monetary Economics: New Approaches to Financial Modelling*, Aldershot: Edward Elgar.



Arestis, P. and Skouras, T. (eds.) (1985) *Post-Keynesian Economic Theory: A Challenge to Neo Classical Economics*, Brighton and New York: Wheatsheaf Books Ltd.

Arshanapalli, B. and Dukas, J. (1993) International Stock Market Linkages: Evidence from the Pre- and Post-October 1987 Period, *Journal of Banking and Finance*, vol. 17, pp. 193-208.

Atje, R. and Jovanovic, B. (1993) Stock Markets and Development, *European Economic Review*, vol.37, June, pp.632-640.

Attanasio, O.P. (1991) Risk, time varying second moments and market efficiency, *Review of Economic Studies*, vol. 58, pp. 479-494.

Bailey, W. and Lim, J. (1992) Evaluating the Diversification Benefits of the New Country Funds, *The Journal of Portfolio Management*, Spring.

Balance of Payments Statistical Yearbook, IMF, various volumes.

Banco Nacional de Mexico, (1989) Review of the Economic Situation of Mexico, no. 764, July.

Barry, B. and Lockwood, J. (1995) New directions in research on emerging capital markets, *Financial Markets, Institutions and Instruments*, vol. 4, no. 5, December, pp. 15-36.

Bekaert, G. and Harvey, C. (1997) Emerging equity market volatility, *Journal of Financial Economics*, vol. 43, no. 1, January, pp.29-77.

Bekaert, G. and Urias, S. (1996) Diversification, Integration and Emerging market closed-end funds, *Journal of Finance*, vol. 51, no. 3, July.

- Bekaert, G., and Harvey, C. (1995) Time-varying world market integration, *Journal of Finance*, vol. L, no. 2, June, pp. 403-444.
- Bekaert, G. (1995) Market Integration and Investment Barriers in Emerging Equity Markets, *World Bank Economic Review*, 9, no. 1, pp.75-107.
- Bekaert, G. and Hodrick, R. (1992) Characterising predictable components in excess returns on equity and foreign exchange markets, *Journal of Finance*, vol. 47, pp. 467-509.
- Bencivenga, V.R., Smith, B.D. and Starr, R.M. (1996) Liquidity of Secondary Capital Markets: Allocative Efficiency and the Maturity Composition of the Capital Stock, *Economic Theory*, vol. 7, no. 1, pp. 10-50.
- Bencivenga, V.R., Smith, B.D. and Starr, R.M. (1995) Transaction Costs, Technological Change and Endogenous Growth, *Journal of Economic Theory*, vol. 67, no. 1, pp. 153-177.
- Bhide, A. (1993) The hidden costs of stock market liquidity, *Journal of Financial Economics*, 34, pp. 31-51.
- Black, F. (1976) Studies in Stock Price Volatility Changes, Proceedings of the 1976 Business Meeting of the Business and Economic Statistics Section, American Statistical Association, pp. 177-181.
- Black, F. and Scholes, M. (1973) The pricing of options and corporate liabilities, *Journal of Political Economy*, vol. 81, no. 3, May-June.
- Bodurtha, J.N. and Mark, N.C. (1991) Testing the CAPM with time varying risks and returns., *Journal of Finance*, 46, pp. 1485-1505.



Bollerslev, T., Chou, R., and Kroner, K. (1992) ARCH modelling in finance: a review of theory and empirical evidence, *Journal of Econometrics*, April-May, pp. 5-59.

Bollerslev, T. (1988) On the correlation structure for the generalised autoregressive conditional heteroscedastic process, *Journal of Time Series Analysis*, 9, pp.121-131.

Bollerslev, T. (1986) Generalised Autoregressive Conditional Heteroscedasticity, *Journal of Econometrics*, 31, pp. 307-327.

Boyd, J. and Smith, B. (1996) The Coevolution of the Real and Financial Sectors in the Growth Process, *The World Bank Economic Review*, vol. 10, no. 2, pp. 371-396.

Brown, W.S. (1991) *Introducing Econometrics*, West Publishing Company.

Bruton, H.J., (1998) A Reconsideration of Import Substitution, *Journal of Economic Literature*, vol. 36, no. 2, June, pp. 903-936.

Buckberg, E. (1996) Institutional Investors and Asset Pricing in Emerging Markets, *IMF Working Paper*, January.

Buckberg, E. (1995) Emerging Stock Markets and International Asset Pricing, *World Bank Economic Review*, 9, no. 1, pp. 51-74.

Buckberg, E. (1993) Emerging stock markets and international asset pricing, in Claessens and Gooptu: Portfolio investment in developing countries, *World Bank Discussion paper* 228, September, pp. 169-198.

Calvo, G., Leiderman, L. and Reinhardt, C. (1993) Capital Inflows and the Real Exchange Rate Appreciation in Latin America: The Role of External Factors, *IMF staff Papers*, vol. 40, no. 1.

Cashin, P., and McDermott, J. (1995) Informational Efficiency in Developing Equity Markets, *IMF Working Paper*, June.

Chan, K.C., Benton, E.G. and Pan, M.S. (1997) International Stock Market Efficiency and Integration: a Study of Eighteen Nations, *Journal of Business Finance and Accounting*, vol. 24, no. 6, July, pp. 803-813.

Chatrath, A., Ramchander, S. and Song, F. (1997) Stock prices, inflation and output: evidence from India, *Applied Financial Economics*, vol. 7, pp. 439-445.

Chaudhary, M.A. and Ali, S.S. (1993) Pakistan's Foreign Dependence, it's Capacity for Debt Repayment and Future Prospects, *Pakistan Economic and Social Review*, vol. 31, no. 1, Summer, pp. 39-61.

Cheung, Y.L. (1993) A note on the stability of the intertemporal relationships between the Asian-Pacific equity markets and the developed markets: a non-parametric approach, *Journal of Business, Finance and Accounting*, January, vol. 20, no. 2, pp. 229-236.

Cheung, Y.L. and Ho, Y.K. (1991) The intertemporal stability of the relationships between the Asian emerging equity markets and the developed equity markets., *Journal of Business, Finance and Accounting*, January, vol. 18, no. 2, pp. 235-254.

Cho, Y.J. and Khatkhate, D. (1989) Financial Liberalisation: Issues and Evidence, *Economic and Political Weekly*, May 20, pp. 1105-1114.

Cho, Y.J. (1986) Inefficiencies from Financial Liberalisation in the Absence of Well-Functioning Equity Markets, *Journal of Money, Credit and Banking*, vol. 18, no. 2, May, pp. 191-199.

Chou, R.Y., Engle, R.F. and Kane, A. (1992) Measuring Risk Aversion from Excess Returns on a Stock Index., *Journal of Econometrics*, 52, pp. 201-205.



Chou, R.Y. (1988) Volatility persistence and stock valuation: Some empirical evidence using GARCH, *Journal of Applied Econometrics*, 3, pp. 279-294.

Choudhury T. (1996) Stock market volatility and the crash of 1987: evidence from six emerging markets, *Journal of International Money and Finance*, vol. 15, no. 6, pp. 969-981.

Christie, A.A. (1982) The Stochastic Behaviour of Common Stock Variances: Value, Leverage and Interest Rate Effects, *Journal of Financial Economics*, 10, pp. 407-432.

Chuhan, P. (1994) Are Institutional Investors an Important Source of Portfolio Investment in Emerging Markets?, *World Bank Working Paper*, January.

Chuhan, P., Claessens, S. and Mamingi, N. (1993) Equity and Bond portfolio flows to Latin America and Asia: The role of external and domestic factors, *World Bank Policy Research Working Paper no. WPS 1160*, July.

Claessens, S. (1995) The Emergence of Equity Investment in Developing Countries: Overview, *World Bank Economic Review*, 9, no. 1, pp. 1-17.

Claessens, S., Dooley, M. and Warner, A. (1995) Portfolio Capital Flows: Hot or Cold?, *World Bank Economic Review*, 9, no. 1, 153-174.

Claessens, S., Dasgupta, S. and Glen, J. (1995) The Cross Section of Stock Returns: Evidence from Emerging Markets, *World Bank Working Paper*, September, No 1505.

Claessens, S., Dasgupta, S. and Glen, J. (1995) Return Behaviour in Emerging Stock Markets, *World Bank Economic Review*, vol.9, no. 1, pp. 131-151.

Clare, A., Garrett, I. and Jones, G. (1997) Testing for seasonal patterns in conditional return volatility: evidence from Asia-Pacific markets, *Applied Financial Economics*, vol. 7, pp. 517-523.

Clark, E., Levasseur, M. and Rousseau, P. (1993) *International Finance*, Chapman and Hall.

Clark, E. (1991) *Cross-Border Investment Risk*, Euromoney Books.

Clark, E. (1991a) Briefing, *Euromoney*, February, pp. 73-6.

Clark, E. (1991b) Briefing, *Euromoney*, April, pp. 79-82.

Clarke, R. (1996) Equilibrium Interest Rates and Financial Liberalisation in Developing Countries., *The Journal of Development Studies*, vol. 32, no. 3, February, pp. 391-413.

Cooper, J.C. (1982) World stock markets: some random walk tests, *Applied Economics*, October, pp. 515-535.

Corbo, V. (1993) Economic Reforms in Chile: An Overview, Paper presented at the Eastern Economic Association Meeting, Washington D.C., March.

Corbo, V. and Fischer, S. (1993) Lessons from the Chilean Stabilisation and Recovery, in *The Chilean Economy Policy Lessons and Challenges*, ed. Bosworth, B., Dornbusch, R. and Laban, R., Washington D.C., Brookings.

Corbo, V. and de Melo, J. (1985) Liberalisation with stabilisation in the Southern core of Latin America, *World development*, Special issue, vol. 13, no. 8, pp. 863-866.

Cornelius, P. (1991) Monetary Policy and the Price Behaviour of Emerging Stock Markets, *IMF Working Paper*.

Cosh, A.D., Hughes, A. and Singh, A. (1989) Openness, Innovation and Share Ownership: The Changing Structure of Financial Markets, World Institute of Development Economics Research, Helsinki, Working Paper no. 74, October.



Cosset, J.C. and Roy, J. (1991) The Determinants of Country Risk Ratings, *Journal of International Business Studies*, 1st quarter.

De Fusco, R., Geppert, J.M. and Tsetsekos, G.P. (1996) Long-Run diversification potential in emerging stock markets, *The Financial Review*, vol. 31, no. 2, May, pp. 343-363.

De Gregorio, J. and Guidotti, P.E. (1995) Financial Development and Economic Growth, *World Development*, vol. 23, no. 3, pp. 433-448.

Demetriades, P.O. and Luintel, K.B. (1997) The direct costs of financial repression: Evidence from India., *Review of Economics and Statistics*, pp. 311-319

Demetriades, P.O. and Luintel, K.B. (1996) Financial development, economic growth and banking sector controls: evidence from India, *Economic Journal*, vol. 106, pp. 359-374.

Demetriades, P.O. and Hussein, K. (1996) Does financial development cause economic growth? Time series evidence from 16 countries., *Journal of Development Economics*, vol. 51, pp. 387-411.

Demirguc-Kunt, A. and Maksimovic, V. (1996) Stock Market Development and Financing Choices of Firms, *The World Bank Economic Review*, vol. 10, no. 2, pp. 341-369.

Demirguc-Kunt, A. and Levine, R. (1995) Stock markets and financial intermediaries: Stylised facts, *World Bank Working Paper*, January.

Demirguc-Kunt, A. and Huizinga, H. (1993) Portfolio investments in emerging stock markets: Direct and Indirect barriers, in Claessens and Gooptu: Portfolio investment in developing countries, *World Bank Discussion paper* 228.

Demirguc-Kunt, A. and Huizinga, H. (1992) Barriers to Portfolio Investments in Emerging Stock Markets, *World Bank Working Paper*, October.

Demirguc-Kunt, A. (1992) Developing Country Capital Structures and Emerging Stock Markets, *World Bank Working Paper*, July.

De Santis, G. (1993) Asset pricing and portfolio diversification: Evidence from emerging financial markets, in Claessens and Gooptu: Portfolio investment in developing countries, *World Bank Discussion paper* 228.

Devereux, M.B. and Smith, G.W. (1994) International Risk Sharing and Economic Growth, *International Economic Review*, vol. 35, no. 4, August, pp. 535-550.

Devereux, M.B. and Smith, G.W. (1991) International Risk Sharing and Economic Growth, Institute for Economic Research, Discussion Paper no. 829, Queen's University.

Diamond, D.W. and Dybvig, P.H. (1983) Bank Runs, Deposit Insurance and Liquidity, *Journal of Political Economy*, vol. 85, pp. 191-206.

Diaz-Alejandro, C. (1985) Good-Bye financial repression, hello financial crash, *Journal of Development Economics*, 19, pp. 1-24.

Dickey, D.A. and Fuller, W.A. (1981) Likelihood ratio statistics for autoregressive time series with a unit root, *Econometrica*, vol. 49, pp. 1057-72.

Dickey, D.A. and Fuller, W.A. (1979) Distribution of the estimators for autoregressive time series with a unit root, *Journal of the American Statistical Association*, vol. 74, pp. 427-431.

Diebold, F.X. and Nerlove, M. (1989) The dynamics of exchange rate volatility: A multivariate latent factor ARCH model, *Journal of Applied Econometrics*, 4, pp.1-21.



Diebold, F.X. (1986) Comment on modelling the persistence of conditional variance, *Econometric Reviews*, 5, pp. 51-56.

Divecha, A., Drach, J. and Stefek, D. (1992) Emerging Markets: A Quantitative Perspective, *The Journal of Portfolio Management*, Fall, pp. 41-50.

Dow, S.C. and Earl, P.E. (1982) Money Matters: A Keynesian Approach to Monetary Economics, Oxford: Martin Robertson.

Drake, P.J. (1980) Money, Finance, and Development, Oxford: Martin Robertson.

Dunham, R. (1989) Emerging markets ripe for investment, *Accountancy*, 104, September.

Eaker, M. and Grant, D. (1989) Optimal Hedging of Uncertain Long-Term Foreign Exchange Exposure, *Journal of Banking and Finance*, vol. 9, pp. 221-231.

Eaton, J., Gersovitz, M. and Stiglitz, J.E. (1986) The Pure Theory of Country Risk, National Bureau of Economic Research, Working Paper no. 1894, April.

The Economist, various volumes.

Edwards, J.L. (1988) Recent Developments in the Theory of Corporate Finance, *Oxford Review of Economic Policy*, vol. 3, no. 4, pp. 1-12.

El-Erian, M. and Kumar, M. (1994) Emerging Equity Markets in Middle Eastern Countries, *IMF Working Paper*, September.

Emerging Stock Market Factbook, International Finance Corporation, various volumes.

Engel, C. and Rodrigues, A.P. (1989) Tests of International CAPM with time varying covariances, *Journal of Applied Econometrics*, 4, pp. 119-138.

Engle, R and Ng, V. (1993) Measuring and testing the impact of news on volatility, *The Journal of Finance*, vol XLVIII, no 5, December.

Engle, R., Ito, T. and Lin, W.L. (1990) Meteor showers or heat waves? Heteroskedastic intra-daily volatility in the foreign exchange market., *Econometrica*, vol. 58, no. 3, May, pp. 525-542.

Engle, R. and Granger, C. (1987) Co-Integration and Error Correction: Representation, Estimation and Testing, *Econometrica*, vol. 55, no. 2, March.

Engle, R.F. and Bollerslev, T. (1986) Modelling the persistence of conditional variances, *Econometric Reviews*, 5, pp. 1-50, 81-87.

Engle, R.F. (1982) Autoregressive conditional heteroscedasticity with estimates of the variance of U.K. inflation, *Econometrica*, 50, pp.987-1008.

Errunza, V., Losq, E. and Padmanabhan, P. (1992) Tests of integration, mild segmentation and segmentation hypotheses, *Journal of Banking and Finance*, vol. 16, pp. 949-972.

Errunza, V. and Padmanabhan, P. (1988) Further evidence on the benefits of portfolio investments in emerging markets, *Financial Analysts Journal*, Jul/Aug

Errunza, V. and Losq, E. (1985) The behaviour of stock prices in LDC markets, *Journal of Banking and Finance*, 9, December, pp. 561-75.

Errunza, V. (1983) Emerging markets: A new opportunity for improving global portfolio performance, *Financial Analysts Journal*, Sep/Oct.

Exchange Arrangements and Exchange Restrictions Annual Report, IMF, various volumes.



Fama, E. (1991) Efficient Capital Markets II, *Journal of Finance*, 46, 1575-1618.

Fama, E. and French, K. (1988) Permanent and temporary components of stock prices, *Journal of Political Economy*, vol. 96, pp. 246-273.

Fama, E. (1965) The behaviour of stock market prices, *Journal of Business*, vol. 38, pp. 34-105.

Financial Times, various papers.

Fischer, B. and Reisen, H. (1994) Pension Fund Investment from Ageing to Emerging Markets, *OECD Policy Brief No.9*.

Fraser, P. and Power, D. (1997) Stock return volatility and information: an empirical analysis of Pacific Rim, UK and US equity markets, *Applied Financial Economics*, vol. 7, pp. 241-253.

French, K. (1980) Stock returns and the weekend effect, *Journal of Financial Economics*, 8, March, pp. 55-69.

Fry, M.J. (1997) In favour of financial liberalisation, *The Economic Journal*, 107, May, pp. 754-770.

Fry, M.J. (1997) *Emancipating the Banking System and Developing Markets for Government Debt*, London and New York: Routledge.

Garrett, I. and Spyrou, S. (1999) Common Trends in Emerging Equity Markets, The Manchester School, forthcoming.

Garrett, I. and Spyrou, S. (1998) Return Predictability in Emerging Equity Markets, *Ekonomia*, vol. 2, no. 2, Winter, pp. 135-144.

Ghani, E. (1992) How Financial Markets Affect Long-Run Growth: A Cross-Country Study, *World Bank*, WPS 843, January.

Glosten, L.R., Jagannathan, R. and Runkle, D. (1991) Relationship between the expected value and the volatility of the nominal excess return on stocks, Unpublished manuscript, J.L. Kellogg Graduate School, Northwestern University, Evanston, IL.

Gooptu, S. (1994) Are Portfolio Flows to Emerging Markets Complementary or Competitive?, *World Bank Working Paper*, September.

Gooptu, S. (1993) Portfolio Investment Flows to Emerging Markets, *World Bank Working Paper*, March.

Grabel, I. (1995) Assessing the impact of financial liberalisation on stock market volatility in selected developing countries, *The Journal of Development Studies*, vol. 31, no. 6, August, pp. 903-917.

Granger, C.W.J. (1983) Co-Integrated Variables and Error-Correcting Models, UCSD Discussion Paper.

Greenwood, J. and Smith, B. (1997) Financial Markets in Development and the Development of Financial Markets, *Journal of Economic Dynamics and Control*, 21, pp. 145-181.

Greenwood, J. and Jovanovic, B. (1990) Financial Development, Growth and the Distribution of Income, *Journal of Political Economy*, vol. 98, no. 5, October, pp. 1076-1107.

Grinold, R., Rudd, A. and Stefek, D. (1989) Global Factors: Fact or Fiction?, *The Journal of Portfolio Management*, Fall, pp.79-88.



Hardouvelis, G. (1990) Margin requirements, volatility and the transitory component of stock prices, *American Economic Review*, 80, pp. 736-763.

Hargis, K. (1997) Forms of Foreign Investment Liberalisation and Domestic Stock Market Development in Emerging Economies, University of North Carolina, Working Paper.

Hargis, K. and Maloney, W. (1997) Emerging Equity Markets: Are they for real?, *The Journal of Financial Research*, Summer, vol. 20, no. 2, pp. 243-262.

Harris, R. (1995) Using Cointegration Analysis in Econometric Modelling, Prentice Hall.

Harvey, C. (1995) Predictable risk and returns in emerging markets, *Review of financial studies*, 8, 773-816.

Harvey, C. (1995) The Risk Exposure of Emerging Equity Markets, *World Bank Economic Review*, 9, no. 1, pp. 19-50.

Harvey, C. (1994) Predictable Risk and Returns in Emerging Markets, *National Bureau of Economic Research*, Working Paper no 4621.

Harvey, C. (1993) Portfolio Enhancement using emerging markets and conditioning information, in Claessens and Gooptu: Portfolio investment in developing countries, *World Bank Discussion paper* 228.

Hauser, S., Marcus, M. and Yaari, U. (1994) Investing in emerging stock markets: Is it worthwhile hedging foreign exchange risk?, *The Journal of Portfolio Management*, Spring.

Hauser, S., and Levy, A. (1991) The Effect of Exchange Rate and Interest Rate Risk on International Currency and Fixed Income Security Allocation, *Journal of Business and Economics*, vol. 43, pp. 375-388.

Heynen, R., Kemma, A. and Vorst, T. (1994) Analysis of the Term Structure of Implied Volatilities, *Journal of Financial and Quantitative Analysis*, vol. 29, no. 1, March, pp.31-56.

Hicks, J.R. (1978) A Contribution to the Theory of the Trade Cycle, Clarendon Press.

Hicks, J.R. (1969) A Theory of Economic History, Oxford: Clarendon Press.

Hicks, J.R. (1937) Mr Keynes and the Classics: a Suggested Interpretation, *Econometrica*, April.

Hietala, P.T. (1989) Asset pricing in partially segmented markets: Evidence from the Finnish market, *Journal of Finance*, vol. 44, pp. 697-718.

Horne, J. (1995) The economics of transition and the transition of economies, *Economic Record*, vol. 71, no. 215, December, pp.379-392.

Huang, Y.S. (1997) An empirical test of the risk-return relationship on the Taiwan Stock Exchange, *Applied Financial Economics*, vol. 7, pp. 229-239.

Hughes, A. and Singh, A. (1987) Takeovers and the Stock Market, *Contributions to Political Economy*, no. 6, pp. 73-85.

International Finance Corporation, Emerging Stock Markets Factbook, various volumes.

International Financial Statistics, IMF, various volumes.

Jarque, C. and Bera, A. (1980) Efficient tests for normality, homoscedasticity and serial independence of regression residuals, *Economics Letters*, 6.

Johansen, S. (1988) Statistical Analysis of Cointegration Vectors, *Journal of Economic Dynamics and Control*, Vol. 12, pp. 231-254.



Johnson, G., Schneeweis, T. and Dinning, W. (1993) Closed-End Country Funds: Exchange Rate and Investment Risk, *Financial Analysts Journal*, Nov/Dec, pp.74-82.

Jun, K.W. (1993) Effects of capital market liberalisation in Korea: Empirical evidence and policy implications, in Claessens and Gooptu: Portfolio investment in developing countries, *World Bank Discussion paper* 228.

Kalecki, M. (1971) Selected Essays on the Dynamics of the Capitalist Economy, 1933-70, Cambridge: Cambridge University Press.

Kalotay, K. and Alvarez, A. (1994) Emerging Stock Markets and the Scope for Regional Cooperation, *UNCTAD*, Discussion Paper No. 79, February.

Kasa, K. (1992) Common Stochastic Trends in International Stock Markets, *Journal of Monetary Economics*, vol. 29, pp. 169-210.

Keane, S. (1993) Emerging Markets - The Relevance of Efficient Market Theory, *ACCA*, Occasional Research Paper No. 15.

Keim, D. and Stambaugh, R. (1984) A Further Investigation of the Weekend Effect in Stock Returns, *Journal of Finance*, vol. 39, July, pp. 819-834.

Keynes, J.M. (1936) The General Theory of Employment, Interest and Money, New York: Harcourt Brace Jovanovich.

Khatkhate, D.R. (1980) False Issues in the Debate on Interest Rate Policies in Less Developed Countries, Banca Nazionale del Lavoro, *Quarterly Review*, no. 133, June, pp. 205-24.

Kim, H. and Singal, V. (1993) Opening up of stock markets by emerging economies: Effect on portfolio flows and volatility of stock prices, in Claessens and Gooptu: Portfolio investment in developing countries, *World Bank Discussion paper* 228.

King, R.G. and Levine, R. (1993) Finance and Growth: Schumpeter might be right, *The Quarterly Journal of Economics*, August, pp. 717-737.

Konz, J.M. (1997) Capital Flows, Competition and Profit Rate Convergence, *Journal of Post-Keynesian Economics*, vol. 19, no. 2, Winter.

Korajczyk, R. (1995) A Measure of Stock Market Integration for Developed and Emerging Markets, *World Bank Working Paper*, June.

Koutmos, G., Lee, U. and Theodosiou, P. (1994) Time-Varying Betas and Volatility Persistence in International Stock Markets, *Journal of Economics and Business*, vol. 46, no. 1, p. 101.

Krugman, P. (1995) Dutch Tulips and Emerging Markets, *Foreign Affairs*, vol 74, no 4, July/August.

Kwan, F.B. and Reyes, M.G. (1997) Price Effects of Stock Market Liberalisation in Taiwan, *The Quarterly Review of Economics and Finance*, vol. 37, no. 2, Summer, pp. 511-522.

Lamoureux, C.G. and Lastrapes, W.D. (1990a) Heteroscedasticity in Stock Return Data: Volume versus GARCH effects, *Journal of Finance*, March, vol. 45, no. 1, pp.221-230.

Lamoureux, C.G. and Lastrapes, W.D. (1990b) Persistence in Variance, Structural Change, and the GARCH Model, *Journal of Business and Economic Statistics*, vol. 8, no. 2, April, pp. 225-234.



Lastrapes, W.D. (1989) Exchange rate volatility and U.S. monetary policy: An ARCH application, *Journal of Money, Credit and Banking*, 21, pp. 66-77.

Lee, I. (1992) Stock market seasonality: Some evidence from the Pacific-Basin countries, *Journal of Business, Finance and Accounting*, vol. 19, no. 2, January, pp. 199-210.

Lee I., Pettit, R. and Swankoski, M.V. (1990) Daily return relationships among Asian stock markets, *Journal of Business, Finance and Accounting*, vol. 17, no. 2, Spring, pp. 265-84.

Levacic, R. and Rebmann, A. (1982) Macroeconomics - an introduction to Keynesian-neoclassical controversies, 2nd ed., Basingstoke: Macmillan.

Levine, R. and Zervos, S. (1998) Stock Markets, Banks and Economic Growth, *American Economic Review*, vol. 88, no. 3, June, pp. 537-558.

Levine, R. and Zervos, S. (1996) Stock Market Development and Long-Run Growth, *The World Bank Economic Review*, vol. 10, no. 2, pp. 323-339.

Levine, R. and Zervos, S. (1993) What We Have Learned About Policy and Growth from Cross-Country Regressions, *American Economic Review*, 83, May, pp. 426-430.

Levine, R. (1991) Stock Markets, Growth and Tax Policy, *Journal of Finance*, vol. 46, no. 4, pp. 1445-1465.

Levy, H. and Sarnat, M. (1970) International Diversification of Investment Portfolios, *American Economic Review*, vol. 60, pp. 668-675.

Lucas, R.E. (1976) Econometric Evaluation: a Critique, in *The Phillips Curve and Labour Markets*, eds. Brunner, K. and Meltzer A.H., Carnegie-Rochester, Conference Series on Public Policy, no. 1, Amsterdam and New York: North Holland.

Mayer, C. (1988) New Issues in Corporate Finance, *European Economic Review*, 32, pp. 1167-1188.

McCallum, B.T. (1996) Neoclassical vs. Endogenous Growth Analysis: an overview, Federal Reserve Bank of Richmond, *Economic Quarterly*, vol. 82, no. 4, Fall.

McKinnon, R. (1973) Money and Capital in Economic Development, Washington DC: Brookings Institution.

MIT Commission on Industrial Productivity (1989) Made in America: Regaining the Productivity Edge, MIT Press, Cambridge, Massachusetts.

Modigliani, F. and Miller, M.H. (1958) The Cost of Capital, Corporate Finance and the Theory of Investment, *American Economic Review*, vol. 48, pp. 201-297.

Mookerjee, R. (1988) The stock market and the economy: The Indian experience 1949-1981, *The Indian Economic Journal*, Oct./Dec., pp. 30-43.

Mullin, J. (1993) Emerging Equity Markets in the Global Economy, *Federal Reserve Bank of New York Quarterly Review*, Summer.

Mullins, M. and Wadhwani, S. (1989) The effect of the stock market on investment, *European Economic Review*, vol. 33, pp. 939-961.

Nelson, B.D. (1991) Conditional Heteroscedasticity in Asset Returns: A New Approach, *Econometrica*, vol. 59, no. 2, March, pp. 347-370.

Newlon, S. (1993) Comments on Portfolio Investments in Emerging Stock Markets: Direct and Indirect Barriers, in Claessens and Gooptu: Portfolio investment in developing countries, *World Bank Discussion paper* 228.



- Obstfeld, M. (1994) Risk-Taking, Global Diversification and Growth, *American Economic Review*, vol. 84, no. 5, December, pp. 1310-1329.
- Odedokun, M.O. (1996) Alternative econometric approaches for analysing the role of the financial sector in economic growth: Time-series evidence from LDCs, *Journal of Development Economics*, vol. 50, pp. 119-146.
- Pagan, A. and Schwert, W. (1990) Alternative models for conditional stock volatility, *Journal of Economics*, 45.
- Pagan, A. (1986) Two stage and related estimators and their applications, *Review of Economic Studies*, vol. 53, no. 4, pp. 517-538.
- Pagano, M. (1989) Trading Volume and Asset Liquidity, *Quarterly Journal of Economics*, pp. 255-274.
- Palley, T.I. (1996) Post-Keynesian Economics: Debt, Distribution and the Macro Economy, Basingstoke: Macmillan.
- Pardy, R. (1992) Institutional Reform in Emerging Securities Markets, *World Bank Working Paper*, May.
- Ram, R. (1999) Financial Development and Economic Growth: Additional Evidence, *Journal of Development Studies*, vol. 35, no. 4, April, p. 164.
- Richards, A. (1996) Volatility and Predictability in National Stock Markets: How Do Emerging and Mature Markets Differ?, *IMF Working Paper*, April.
- Ross, S.A. (1989) Information and Volatility: the No-Arbitrage Martingale Approach to Timing and Resolution Irrelevancy, *Journal of Finance*, vol. 44, no. 1, March, pp- 1-18.

- Roubini, N. and Sala-i-Martin, X., (1992) Financial Repression and Economic Growth, *Journal of Development Economics*, vol. 39, no. 1, July, pp. 5-30.
- Saint-Paul, G. (1992) Technological Choise, Financial Markets and Economic Development, *European Economic Review*, vol. 36, no. 4, May, pp. 763-781.
- Samuelson, P.A. (1948) Foundations of Economic Analysis, Cambridge, MA: Harvard University Press.
- Scholes, M. and Williams, J. (1977) Estimating Betas from Nonsynchronous data, *Journal of Financial Economics*, vol. 5, no. 3, December, pp. 309-327.
- Schwert, W. (1989) Why does stock market volatility change over time?, *The Journal of Finance*, Vol. XLIV, No. 5, December.
- Sinclair, C.D., Power, D.M., Lonie, A.A. and Avgoustinos, P. (1994) An investigation of the stability of relationships between returns from emerging stock markets, Discussion Paper in Accountancy and Business Finance, Dundee University.
- Singh, A. (1997) Financial Liberalisation, Stockmarkets and Economic Development, *The Economic Journal*, 107, May, pp. 771-782.
- Singh, A. (1992) The Stock Market and Economic Development: Should Developing Countries Encourage Stock Markets?, *UNCTAD*, Discussion Paper no 49, October.
- Singh, A. and Hamid, J. (1991) Corporate Financial Structures in Developing Countries, International Finance Corporation, Economics Department, Washington D.C.
- Shapiro, A.C. (1985) Currency Risk and Country Risk in International Banking, *Journal of Finance*, vol. 40, no. 3, July, pp. 881-893.



- Sharma, J.L. and Kennedy, R.E. (1977) A comparative analysis of stock price behaviour on the Bombay, London and New York stock exchanges, *Journal of Financial and Quantitative Analysis*, September, pp. 391-413.
- Shaw, E.S. (1973) *Financial Deepening in Economic Development*, New York: Oxford University Press.
- Solinger, A. (1994) Reaching for return, *Institutional Investor*, April.
- Solnik, B.H. (1977) Testing International Asset Pricing: Some Pessimistic Views, *Journal of Finance*, vol. 32, pp. 503-512.
- Solnik, B.H. (1974) Why not Diversify Internationally rather than Domestically? *Financial Analysts Journal*, vol. 30, pp.48-54.
- Speidell, L. and Sappenfield, R. (1992) Global Diversification in a Shrinking World, *The Journal of Portfolio Management*, Fall, pp. 57-67.
- Stiglitz, J.E. (1994) The role of the state in financial markets, in *Proceedings of the World Bank Annual Bank Conference on Development Economics 1993*, ed. Bruno, M. and Pleskovic, B., World Bank, Washington D.C., pp. 19-52.
- Stiglitz, J.E. (1985) Credit Markets and the Control of Capital, *Journal of Money, Credit and Banking*, vol. 17, no. 2, May, pp.133-152.
- Subrahmanyam, M.G. (1975) On the Optimality of International Capital Market Integration, *Journal of Financial Economics*, vol. 2, pp. 3-28.
- Summers, L. (1986) Does the stock market rationally reflect fundamental values?, *Journal of Finance*, vol. 41, pp. 347-368.

Taliente, D. and Fraser, P. (1995) Equities and Emerging Stock Markets, *The Royal Institute of International Affairs*, Discussion Paper.

Tauchen, G.E. and Pitts, M. (1983) The Price Variability-Volume Relationship on the Speculative Markets, *Econometrica*, 51, pp. 485-505.

Taylor, S. (1986) Modelling Financial Time Series, John Wiley and Sons Ltd.

Tesar, L. and Werner, I. (1995) U.S. Equity investment in Emerging Stock Markets, *World Bank Economic Review*, 9, no. 1, pp. 109-129.

Velasco, A. (1993) Comments on Opening up of stock markets by emerging economies: Effect on portfolio flows and volatility of stock prices, in Claessens and Gooptu: Portfolio investment in developing countries, *World Bank Discussion paper* 228.

Wilcox, J. (1992) Taming Frontier Markets, *The Journal of Portfolio Management*, Fall, pp. 51-56.

Wilcox, J. (1992) Global Investing in Emerging Markets, *Financial Analysts Journal*, Jan./Feb., pp. 15-19.

World Debt Tables, World Bank, various volumes.